AVIATION WEEK

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AUG. 31, 1953

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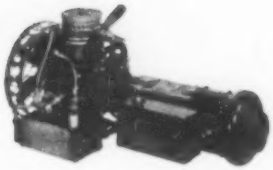
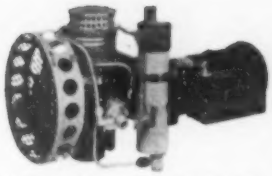
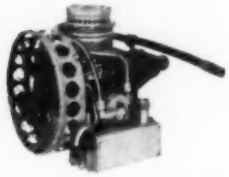
Airborne. 400 cycle — 208v AC drive. Horizontal sump.



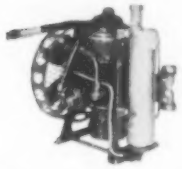
Airborne. 28v — 3½ hp motor. Horizontal sump. Radio noise suppressor.



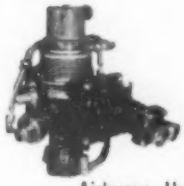
Airborne. 28v — 3½ hp motor. Vertical sump. Radio noise suppressor.



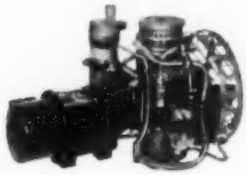
Airborne. Hydraulic drive. 1500 lb. hydraulic system. Horizontal sump.



Airborne. Hydraulic drive. 1500 lb. hydraulic system. Vertical sump. Pressurized inlet.



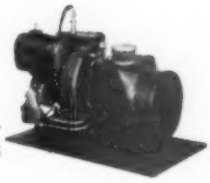
Airborne. Hydraulic drive. 3,000 lb. hydraulic system. Pressurized inlet. Remote sump.



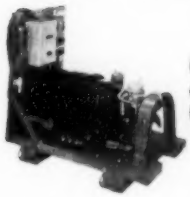
Airborne. 28v—2 hp motor. Vertical sump. At sea level, and at 15,000 ft. delivers 2 cfm of free air compressed to 3,000 psi.

fit a KIDDE 4-stage compressor to your pneumatics needs

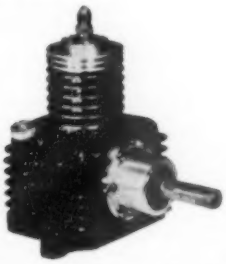
in the air . . . on the ground



Ground application. Here a portable gasoline motor is used as a driving unit.



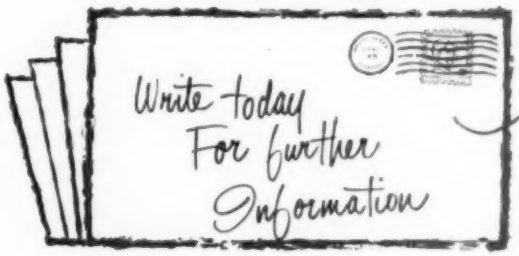
Ground application. Here the compressor can be driven by a 60 cycle 220 volt motor.



Airborne. For personal planes. Belt driven. Integral sump. At sea level, delivers ¼ cfm of free air compressed to 500 psi.

Except where indicated the Kidde Compressor delivers 4 cfm of free air compressed to 3,000 psi at sea level.

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc. and its associated companies.



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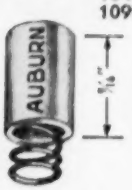
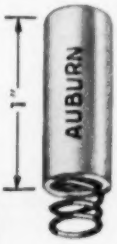


1041-C Steatite
1041-M Mycalex
1041-D Alumina
(AN 4164-2)

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)



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CC4013 Alumina

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Used with all 11/16" connectors on 5 mm cable

AA30-313
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Used with all 9/16" and 11/16" connectors for 5 mm cable

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Aviation Week

Volume 59 — August 31, 1953 — Number 9

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The Navy Learns to Fly—

In June of 1911 Lieut. John H. Towers (left) and Lieut. T. H. Ellyson (right) were ordered to Hammondsport, N. Y. to be taught to fly at Glenn Curtiss' flying school. They were the Navy's first two air pilots, and subsequently both were to rise high in the ranks of the naval air service.

● Our nation's naval air arm has come a long way since the days when the young Lieutenants Towers and Ellyson learned to fly.

And through the years, these great advances in aeronautical engineering have been matched by equally important developments in aviation fuels.

Phillips Petroleum Company, a pioneer in the development of fuels for all ranges of flight, is today one of the country's largest suppliers of aviation gasolines for commercial, military and private use. Phillips is always ready with new fuels for the very latest developments in turbo-props and jets . . . in addition to supplying great quantities of 115/145 grade aviation gasoline.

Rely on Phillips for dependable, high performing aviation products.

The Naval Air Cadet's first landing on an aircraft carrier marks his promotion from cadet to full-fledged naval aviator. Here the pilot of a U. S. Navy Skyraider receives instructions for landing aboard the U.S.S. Tarawa.

Phillips 66

AVIATION PRODUCTS

AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

1903 50TH ANNIVERSARY OF THE AIRPLANE 1953

Throw Away Your Monkey-Wrench...

NEW FINGERTIP VALVE ENDS BLEEDING PROBLEMS FOREVER

Now you can bleed any system with a twist of your fingers!

The new Greer-Lane semi-automatic bleeder valve* is so deceptively simple, you will wonder why it took so many years to reach the market. But it is here at last, and bleeding your hydraulic system—or dumping air pressure in your pneumatic system—are the simple operations they were meant to be.

In fact, nothing could be simpler. You twist to open, release to close. It is fast, clean, safe, *and self-cleaning!* No sediment can clog its tiny port openings or mar its operation. Precision-made, too, to give years of dependable, trouble-free service.

Bleeding time is cut to minutes; costly hydraulic fluid is conserved. "Oil-gushers" spouting from present methods are gone forever. The free end of a bleeder valve hose connected to the port opening may be immersed in a beaker of fluid and carefully watched for the end of the tell-tale bubbles and the first signs of oil.

Don't let bleeding rob you of valuable man-hours and production. Avoid costly downtime by installing the new Greer-Lane semi-automatic bleeder valves on your hydraulic or pneumatic equipment. These dependable valves will pay their low cost in the time and hydraulic fluid they save in a few times use. Write or call for details and prices today! End bleeding problems tomorrow!

*Patent Pending

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NEWS DIGEST

Domestic

Flying Tiger-Slick Airways merger ran into official opposition from CAB staff in its brief to the Board examiner last week. Counsel argued: The carriers did not show that service would improve; costs would not be cut substantially; merger would reduce competition; and the surviving company would be heavily burdened with debt and 5½% preferred stock, with insufficient common equity. Next steps are examiner's recommendation and Board decision.

Commercial aviation gas soon may be freed of a government order increasing use of tetraethyl lead as a substitute for alkylates to raise octane ratings, Petroleum Administration for Defense announces. Deputy Administrator Joseph A. LaFortune says PAD will repeal the two-year-old regulation if U. S. refiners report the action will not hurt production. But he cautions that full expansion of alkylation facilities necessary to meet military requirements in an all-out emergency still has not been reached, warns that a shortage of aviation gasoline continues.

Civil Aeronautics Board celebrated its 15th anniversary Aug. 22, and chairman Oswald Ryan marked his 15th year as a CAB member.

Mass B-36 flight spanned the Pacific last week in a nonstop training operation from North America to Yokata AFB, Japan. Air Force cloaked the flight under strict secrecy simulating wartime conditions. Number of B-36s participating in the operation, point of departure and flight times are not known.

Gen. George C. Kenney, retired wartime commander of Far East Air Forces and postwar commander of the Strategic Air Command, was elected president of the Air Force Assn. at its annual convention last week in Washington. Kenney succeeds Arthur F. Kelley of Western Air Lines, who was named AFA board chairman.

USAF F-84Gs crossed the Atlantic Aug. 20 in the longest nonstop flights to be completed by single-engine jet fighters. Seventeen Thunderjets flew 4,485 mi. from Turner AFB, Albany, Ga., to Lakenheath, England, in 11 hr. 20 min.; eight other F-84s landed at Nouasseur, French Morocco, 10 hr. 21 min. after taking off from Turner on the 4,475-mi. flight. Planes were refueled in flight but three of the fighters en route to England were forced to land at Keflavik, Iceland, because of fuel shortage.

Neptune Gets Jet Boosters

First photo of one of two Lockheed P2V Neptunes fitted with two 3,400-lb.-thrust Westinghouse J34 jet engines, one under each wing, as part of an experimental program for augmenting the plane's piston engine power. Arrow indicates jet installation under port wing of P2V-6. A P2V-5 also is involved in the jet study (Aviation Week Aug. 10, p. 60). It is estimated that with the jets installed, the P2V's climb rate can be doubled and runway requirement reduced. Extra power also will be available for runs on target, using the jets in conjunction with the plane's Wright R3350-30WA Turbo Compound piston engines. The jets are attached by three bolts and are quickly detachable, Lockheed engineers say. A noteworthy feature, is the use of Fiberglas plastic in construction of the jet nacelle forward nose sections.

C-99 transport carried 61,000 lb. of cargo and 23 crewmen and observers on its initial trans-Atlantic crossing to Germany this month, returned to Kelly Field at San Antonio, Tex., with 60,000 lb. of aircraft engines, Air Force reports. The double-deck transport version of the B-36 "smashed every international cargo-handling record in existence," AF claims, and "opens new frontiers in heavy airlift business."

First successful test of an aircraft engine turbosupercharger—developed 35 years ago by the late Sanford Moss of General Electric Co.—was commemorated last week at ceremonies on Pikes Peak, Colo., site of the trial.

Jet engine test plant will be built for Navy's Bureau of Aeronautics at Perry Township, Ohio, to evaluate materials, components and accessories for new turbine powerplants. Thompson Products, Cleveland, has been awarded the contract to build and operate the new $1,286,000 facility, which will accommodate engines of considerably higher thrust than those used in current aircraft. Thompson officials say the company has no intention of developing a jet powerplant of its own in the Naval industrial reserve aircraft plant.

Financial

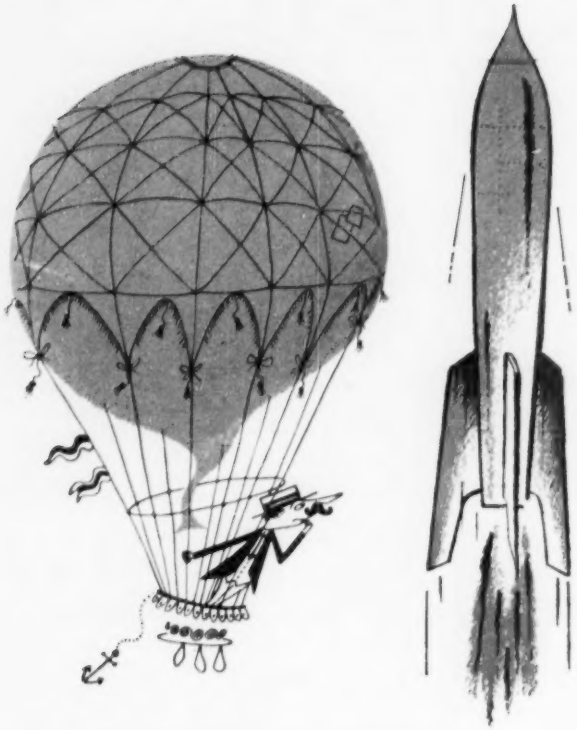
Curtiss-Wright Corp., Wood-Ridge, N. J., reports a consolidated profit of $5,735,078 from net sales totaling $205,468,022 for the first half of 1953, compared with a profit of $3,335,108 and $146,549,561 in sales for the first six months of last year. Backlog and scheduled production under letter contract: $1,050 million.

International

Soviet air force displayed 424 military jet aircraft last week at Russia's annual air show in Moscow, more than doubling the number of jets shown last year. But Western observers report they noted no new types in the demonstration.

Sabena Belgian Airlines will begin carrying passengers on its new scheduled inter-European helicopter service Sept. 1, reserved for mail operations since the copter network was started Aug. 3 (Aviation Week Aug. 10, p. 27).

Prof. Ludwig Prandtl, aerodynamics expert who established a basic theory on the connection between air resistance and wing lift and later developed the first windtunnel, died this month at Gottingen, Germany. He was 78.



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The Aviation Week

August 31, 1953

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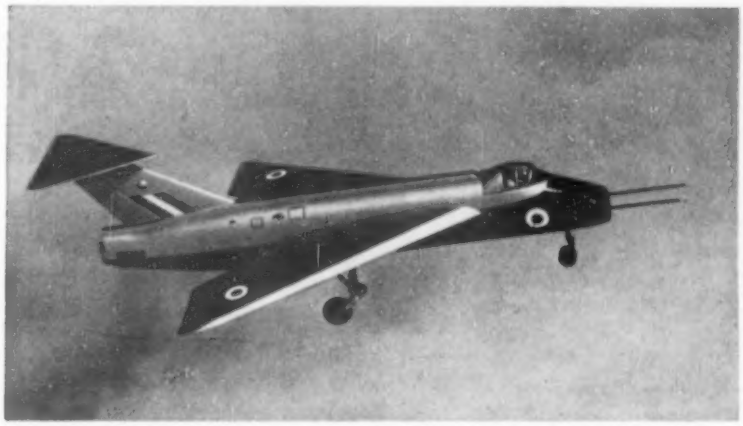
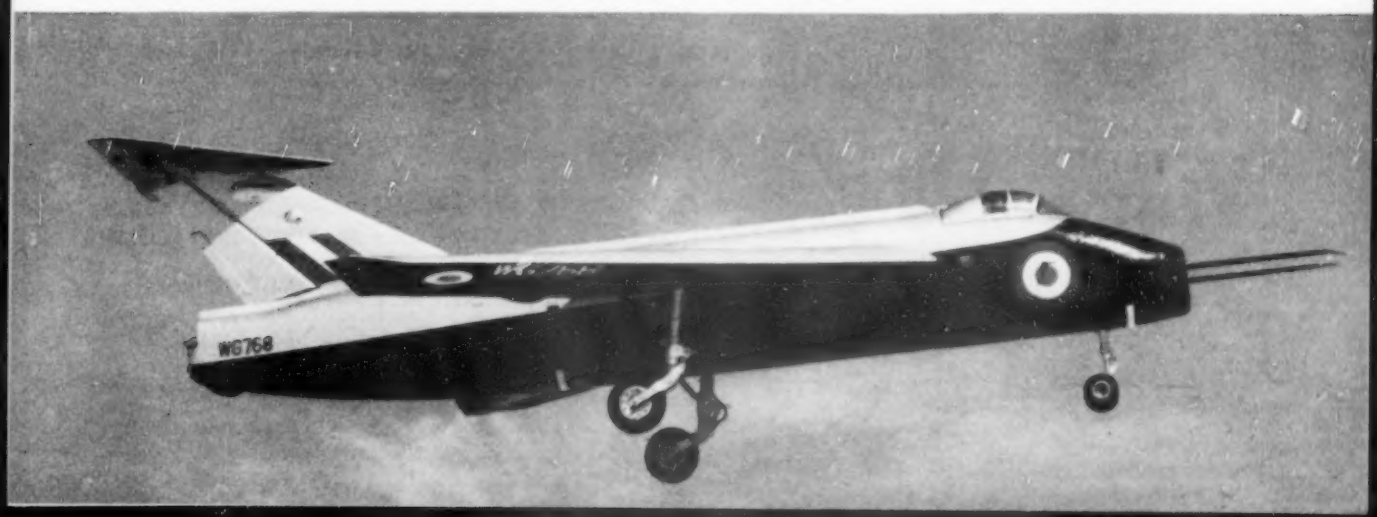
MOONEY FOUR-PLACER FLIES—First photo of new Mooney Model 20 Scotsman four-seat personal plane which made its first flight Aug. 10 at Kerrville, Tex. The plane is powered by a 145-hp. Continental and cruises at more than 160 mph.

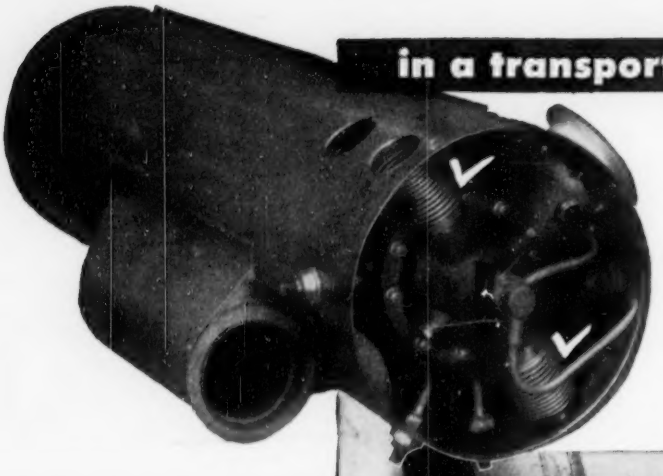
New Personal And Military Planes Tested



SHORT ENTERS NEW TEST PHASE—Two new views (above right and below) of Short S.B. 5 sweptwing research plane. The craft is now flying with its wings swept 60 deg. Previously they were swept 50 deg. Wing sweep is adjustable on the ground.

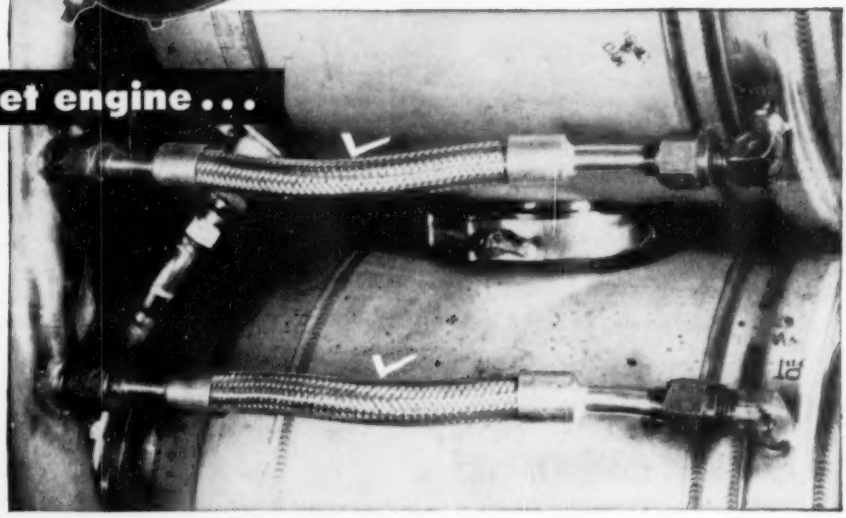


in a transport heater . . .



300,000 B.T.U. heater manufactured by Surface Combustion Corp. for Douglas DC-6A, DC-6B and DC-7 models. The Rex-Flex units house the spark plug assembly and serve to eliminate vibration and correct for misalignment.

or a fighter's jet engine . . .



¾" I.D. Rex Flex hose is used in the water injection system of this General Electric Co. J-47 jet engine manufactured by the Studebaker Corporation. It absorbs axial and lateral motion and vibration at pressures to 600 psi and temperatures to 500° F.

Make flexible connections secure with REX-FLEX Stainless Steel Hose

IN the many critical connections in any aircraft or engine where flexibility and rugged durability must be combined, it will pay you to rely on Flexonics engineering skill and manufacturing know-how. As the pioneer manufacturer of stainless steel flexible metal hose, bellows, ducting and connectors, Flexonics Corporation has grown up with the modern aircraft industry. Your problems are our problems. For specific recommendations on any flexible connection problem, see your local Flexonics sales engineer or send an outline of your requirements.

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Flexible metal hose

Expansion joints

Aircraft components

Metallic bellows

WHO'S WHERE

In the Front Office

J. L. Stinson has been re-elected president of Airway Products, Inc., Pontiac, Mich.

Charles F. Roberts and **Albert A. Leedom** are new assistants to the president of Cooper Precision Products, Los Angeles, wholly owned subsidiary of Standard Pressed Steel Co. Roberts is in charge of finance and accounting; Leedom takes over quality control, tooling and production methods.

Changes

W. E. Huskins has been appointed administrative assistant to the vice president-operations of Northwest Orient Airlines. **R. C. Zinn** becomes NWA's aircraft services director.

James E. Maher, former assistant to the president of Chase Aircraft Co., has joined Henry J. Kaiser Co. as assistant to the vice president. **H. Walton Cloke** is new coordinator of public relations for the Kaiser companies in Washington, D. C.

Cecil B. Ellis, one-time coordinator of the nuclear aircraft project at Oak Ridge National Laboratory, has been appointed head of the research dept., Laboratory Div., Walter Kidde Nuclear Laboratories, Garden City, N. Y. Other new department heads: **J. J. Byrnes,** engineering, Laboratory Div., and **Karl Puechl,** theoretical, Development Div.

Fred E. Chambers has become manager of industrial relations and security at Convair's Ft. Worth Div. Other changes: **Max G. Burland,** staff assistant to the vice president-administration, San Diego; **James L. Budros,** personnel manager, and **E. L. Clerc,** labor relations supervisor.

Frank J. Hodnick has joined Solar Aircraft Co., San Diego, as ceramic research engineer. **Rankin H. McDaniel** is new assistant general production superintendent.

Col. James P. Ferrey has been named USAF plant representative at Boeing Airplane Co.'s Wichita Div., succeeding **Col. Frederick A. Henry,** who has returned to inactive duty. **Lt. Col. John R. Medberry** is new chairman of the B-47 Production Committee.

Ernest Wenigmann has been appointed factory superintendent of Republic Aviation Corp., Farmingdale, N. Y. **Ralph Bonafede** is new assistant to the factory manager.

R. K. Wead has been promoted to chief of Marquardt Aircraft Co.'s new application engineering dept. **Paul J. Papanek** has become eastern district manager of the Van Nuys, Calif., firm.

Honors and Elections

John W. Myers, vice president of Northrop Aircraft, Inc., Hawthorne, Calif., has received the Night Fighter Assn.'s first special service award for his pioneering work on all-weather interceptors.

Samuel F. Pryor, vice president of Pan American World Airways, has been elected to the executive committee of the American Heritage Foundation.

INDUSTRY OBSERVER

► Republic Aviation has USAF production contracts for both its new supersonic fighter types, the F-103 and F-105. The F-103 is a development of the XF-91 that features an inversely tapered wing and combination turbojet-rocket power. The F-105 is a delta-wing design and will be built in both a fighter and reconnaissance version.

► **Wright R3350-BD-1 engines on Chicago and Southern Air Lines L649A Constellations have been approved by CAA for 1,900 hr. between overhauls. This is highest between-overhaul time approved for any engine.**

► Official USAF confirmation on production of a Russian turboprop B-36-type long-range strategic bomber was given by Air Force Secretary Harold Talbott at the Air Force Assn. convention in Washington. Although none of these bombers appeared at the recent Red air force public display, Talbott said USAF is virtually certain they are in production.

► **Air Force reports the Boeing XB-52 and YB-52 Stratofortress bomber prototypes have logged more than 700 hr. of flight test time and their performance has "surpassed expectations."**

► General Electric's Hermes missile project has been sharply cut by the Army with a heavy reduction in personnel at the Malta, N. Y., rocket test station. Hermes was a relatively short-range surface-to-surface bombardment missile.

► **In the second and third test flights of the new Australian-built Sabre fighter, powered with a Rolls-Royce Avon engine, the airplane was dived faster than the speed of sound, and in one dive was reported to have reached a speed of 900 mph., according to unofficial reports from Melbourne.**

► Marines are pleased with the progress of their Lacrosse close support missile. It uses solid rocket propellant for initial flight and then glides into the target. Lacrosse has a range of 8 to 10 miles.

► **Saunders-Roe of England is interested in developing hydro-ski water-based fighters similar to the Convair F2Y-1, currently being flight tested at San Diego for the Navy and Marines.**

► Several major sub-system contracts have been awarded by Convair, with USAF approval, on the XB-58 supersonic bomber project, the first weapons system to be handled under a single prime contract (AVIATION WEEK Aug. 17, p. 82). Autopilot and control sub-system went to Bendix Eclipse; bombing and navigation to Sperry and defensive armament system to General Electric. The four turbojet engines will be developed by General Electric under a direct Air Force contract specifically exempt from Convair's single prime contract.

► **Lee Atwood, president of North American Aviation, Inc., confirms earlier reports (Aviation Week June 8, p. 19) that the YF-100 has been flying regularly at supersonic speeds in level flight. This is the first fighter in the world known to have exceeded Mach 1 regularly in level flight without the benefit of an initial dive. It is powered by a P&WA J57 with afterburner producing about 15,000 lb. thrust. During the initial 60 days of flight testing at Edwards AFB, the YF-100 made 66 flights.**

► First tangible results of Cessna Aircraft Co. Helicopter Division's program, started after Cessna bought Seibel Helicopter Co. more than a year ago, has just begun flying at Wichita. It is a small helicopter suitable for agricultural or perhaps military liaison work, but Cessna is doing it as an independent research venture without military financing.

► **Rohm and Haas has developed a new transparent plastic with improved heat resistance and crazing resistance characteristics, designated as Polymer K and aimed at meeting higher heat requirements at the frictions developed in highspeed flight.**

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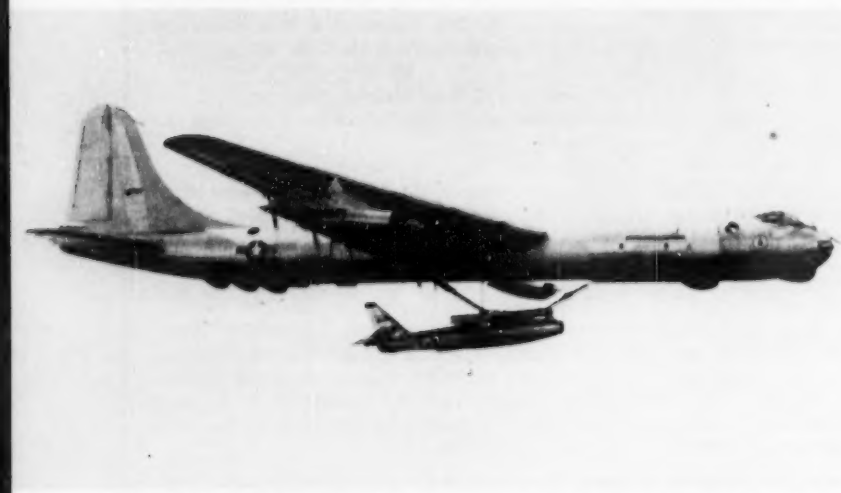
B-36 Teams With F-84 to Carry A-Bomb

APPROACH by Republic YRF-84F parasite to frame extended below Convair RB-36D.



RETRACTION of Thunderstreak into Convair's bomb-bay after successful contact.

STOWED in RB-36D bomb-bay (below), fighter can be carried to within target range.

- **Parasite tactic delivers 'payload' at sonic speed.**
- **System gives striking range up to 5,000 mi.**

By Robert Hotz

A new tactic for delivering atomic bombs at sonic speeds over ranges up to 5,000 mi. was revealed last week by the U.S. Air Force.

Known as FICON, the new system combines the talents of the Convair B-36D intercontinental bomber and the Republic F-84F Thunderstreak, 700-mph. fighter-bomber, into a new lethal tactic for long-range delivery of atomic weapons at speeds that can baffle any air defense system in the immediate future.

In revealing the FICON program, USAF began lifting the veil of secrecy on its plans (AVIATION WEEK June 22, p. 12) for extending the useful life of its B-36 fleet long beyond the day when it will be superseded by the Boeing B-52 eight-jet Stratofort as the first-line offensive weapon of the Strategic Air Command.

▶ **Triple Threat**—This program includes three future functions for the B-36 fleet:

- **Aircraft carrier** for highspeed fighter-type planes capable of delivering atomic weapons.
- **Airborne early warning radar picket plane.**
- **Highspeed aerial tanker** for refueling B-47 and B-52 jet bombers on long-range missions.

Use of parasite fighter-type aircraft was part of the original design concept of the B-36. An early postwar parasite—the McDonnell XF-85—was designed to fit into the bomb-bay of the B-36. Initial experiments in attempting to hook onto a trapeze extended from a B-29 proved so hazardous that the project was abandoned in 1948.

▶ **Same Basic Idea**—The FICON project represents another approach to the same basic idea of combining the extreme range of the B-36 with highspeed over-the-target performance of modern fighters. The system uses a movable steel alloy yoke that is lowered from the B-36 bomb-bay. The yoke consists of a U-shaped frame with a straight beam extending down from the bottom of the U.

The parasite fighter is equipped with a probe, mounted on the top of the nose forward of the cockpit. This probe is similar to those used in the probe-and-drogue refueling method. The beam extending from the U-frame is equipped with a contact hole similar to those refueling drogues.

Fighter makes initial contact by engaging its probe with the hole in the yoke which is suspended underneath the B-36 bomb-bay. After the fighter's probe is engaged, the U-shaped frame lowers onto the fighter fuselage, holding the plane firmly with a three-point contact. The frame and fighter are then raised by a hydraulic lift to fit snugly into the bomb-bay.

▶**Other Trials**—The fighter is drawn up as far as wing and horizontal tail surfaces permit with the remainder of the plane protruding externally from the B-36. The F-84F horizontal tail has considerable dihedral. This was modified to anhedral to permit the tail to be drawn farther into the bomb-bay.

Successful FICON flights with straightwing F-84E and F-84G aircraft were made during the summer of 1952. Later, early model sweptwing F-84Fs were used. The FICON technique using the F-84F will be demonstrated publicly for the first time at the National Air Show this week in Dayton.

The fighter can be carried by the B-36 during initial takeoff and during cruising flight in the stowed position. The fighter pilot can enter the fighter internally from the B-36 prior to lowering of the B-36 yoke to launching position. A special intercom system enables the F-84F pilot to communicate with the B-36 crew during the launching process.

▶**New Weapon**—Recovery in flight is made according to the procedure described earlier. The B-36 carries homing devices that guide the fighter pilot back to the mother plane after completion of the fighter mission.

USAF official announcement specified only that FICON would be used for long-range aerial reconnaissance. But the recent Atomic Energy Commission announcements of a new "family of atomic weapons" under development and USAF revelation that F-84G, straightwing predecessor of the F-84F, had been modified to deliver atomic bombs, make it obvious that FICON has special significance as a new USAF long-range, highspeed atomic delivery method.

Both Republic and Convair have a green light from Air Force to modify a considerable number of Thunderstreaks and B-36s for operational use of FICON.

Still in an experimental state is another parasite device known as wingtip hook-on (Aviation Week Feb. 27, 1950, p. 12). This would enable an additional F-84F to hook on to each wingtip of the B-36 for a "free ride" to the target area. Using FICON and wingtip hook-on, a B-36 presumably could carry three small atomic bomb carriers capable of approaching the target at sonic speeds from a variety of directions—a formidable problem for air defense in its current state of the art.

▶**Some Bugs**—There is a problem of aerodynamic stability involved in the wingtip hook-on technique and attempts are now being made to link the autopilot of the attached fighters to the bomber autopilot. It was this type of experiment that sent an F-84 crashing into the wing of a B-29 experimental mother plane some months ago over Long Island, killing both fighter pilot and bomber crew.

USAF recently has indicated a growing requirement for airborne early warning radar to guard approaches to North America, where establishment of a ground radar station chain is difficult, and also to extend the range of early warning radar beyond the line of sight limitations of ground stations. When Gen. George Kenney was commander of SAC (Aviation Week Aug. 18, 1947, p. 15), he told Aviation Week that part of the B-36 fleet should be equipped as early warning radar picket planes to patrol the Arctic and the sea approaches to North America.

The B-36 has the internal cubic capacity to carry a large quantity of radar and avionic gear with a longer lowspeed cruising range than any aircraft now flying. This combination has USAF looking toward B-36 modification as one answer to their expanding requirement for long-range radar picket planes.

▶**Comparisons**—The large cubic capacity, plus a 435-mph. top speed, combine to make the case for the B-36 as a tanker for jet bombers. The speed compatability between the B-36, using all of its six piston and four jet engines, and the B-47 and B-52 jet bombers is considerably better than that of the piston-powered KC-97 tankers now being used for refueling duties.

Fuel delivery capacity of the B-36 is also considerably greater than that of the KC-97 tanker. Convair has equipped several B-36s experimentally as tankers and conducted refueling operations with B-47 bombers. It probably would be feasible to equip B-36s with modification kits that would permit them to be used interchangeably as bombers and tankers in the field.

Convair still is building the B-36 at its Ft. Worth plant. When the last B-36 rolls off the Ft. Worth production line in the fall of 1954, USAF will have a fleet of about 400 composite-powered intercontinental bombers. Cost of the big bombers has decreased from about $2.5 million each for the first production order to about $2 million on current production, despite a period of generally rising labor and material costs.

▶**Backbone of SAC**—Although USAF originally estimated it would have SAC units equipped with B-52 Stratoforts by 1954, it probably will be at least another two to three years before a significant number of B-52 wings are combat ready and the B-36 actually will phase out as the first-line long-range SAC bomber.

Equipped for duty as a long-range aircraft carrier for atomic-bomb-carrying fighters, an early warning radar picket and an aerial tanker, the B-36 fleet could perform in the USAF active inventory far longer than even its staunchest proponents originally anticipated.

NAA Proposes Design Penalties

A recommendation that the military impose financial penalties on aircraft firms whose planes fail to meet original design specifications was made by J. L. Atwood, president of North American Aviation, Inc., at the air power symposium during the Air Force Assn. convention in Washington last week.

"I am specifically asking for maximum realism in procurement competitions," Atwood told the convention. "Our efforts in industry will be most effective if the competition is tough, fair and clearly oriented toward product quality. There is a disproportionate premium attached to winning a design competition.

"It is the ticket of admission to the production show, but after all a design is just a list of promises based on calculations which in turn are predicated on assumptions that vary with the optimism of the designer. Rarely, if ever, have there been any real penalties when glowing forecasts of the design proposal were adjusted downward to the physical facts of the actual airplane. Then it is too late to change."

▶**Design Realism**—"I believe this is a serious problem that deserves study by all responsible officers of the Air Force and Navy. If the imposition of financial penalties for non-attainment of performance guarantees is the only workable answer, then I believe such penalties should be invoked.

"I believe that most of the responsible airframe, engine and other contractors would agree wholeheartedly with the principle of awarding contracts

on the basis of design realism, economy, efficiency and whatever fair and impartial measures of comparison the procurement people can devise. There is really no other way to maintain the integrity and effectiveness of American aeronautical development.

"I want to emphasize that the government does not owe aircraft companies a living. It is essential to the success of our development programs that the government award contracts as objectively as possible on the basis of genuine merit.

"The personnel responsible for procurement must put aside any ideas that they may have been encouraged to develop during the past 20 years that they are social planners, economic stabilizers or anything else but hard-boiled customers with a job to do and a determination to get the best equipment to do the job."

▶ **Thermal Barrier**—Discussing technical problems facing the aircraft industry, Atwood said the problems of developing satisfactory transonic combat aircraft are more difficult than those involved in developing satisfactory supersonic missiles. He emphasized that the thermal barrier now lying astride piloted aircraft flight at speeds above Mach 2 now looks even more formidable than the problems of the sonic barrier did when they were first faced eight years ago.

"There are many ramifications to this thermal problem," Atwood said. "One is the fact that the external heat is supplemented by internal heat from the jet engine; even with present powerplants, we are dealing with tailpipe temperatures on the order of 1,600F. Another is the difficulty of keeping equipment—presently designed for maximum temperatures of 120 to 160F—cool enough so that it will operate.

"Still another problem is that of material creep—the phenomenon of gradual deformation of metals under prolonged load. Because the rate of creep is greatly accelerated at higher temperatures, we may ultimately have to limit the service life of certain highly stressed structural parts."

▶ **Real Problem**—"Thus far we have only scratched the surface of the thermal problem. In certain structural assemblies, we have used titanium which has satisfactory strength up to 600F, but we have been handicapped by inadequate supply and deficient quality because of the processing of this material is still in the development stages.

"We have explored ways of developing transparent canopies capable of resisting higher temperatures, and we have done considerable work in cooling structures and equipment both by ducted air and by refrigeration.

"In every respect, the problem looks more difficult than the aerodynamic barriers to sonic flight looked eight years ago, and I very much doubt that we can work our way through the thermal problem as quickly as we learned how to live with sonic shock waves.

"One big reason for this gloomy outlook is that solutions depend in large part upon advancements in basic technologies like metallurgy, wherein progress has never been rapid. More than 10 years elapsed between the introduction of 24S aluminum alloy and 75S—the latter representing only a 15 to 20% improvement in strength."

▶ **ARDC View**—Future trend of aircraft development will be toward smaller, higher performance planes that will still have the range necessary to do the strategic bombing job, Maj. Gen. James McCormack, Jr., vice commander of the Air Research and Development Command, told the symposium.

Gen. McCormack outlined four clear technical trends in the development of military air power:

• **Increasing emphasis on atomic energy** in air power. He stressed that the atomic miracles of the past 10 years represent only the beginning of the atomic age and warned that not all atomic "miracles" of the future will be American achievements.

• **Increase of speed** in military air power vehicles to many times the speed of sound.

• **Increase in the degree** of automatic operation of weapons through electronic, sonic, infra-red and other techniques.

• **Increase in the trend** toward development of weapons systems, rather than just weapons.

Discussing the strategic bombing system of the future, Gen. McCormack said:

"It is well within this country's capabilities during the course of the next generation, and possibly in a much shorter time, to bring forth a strategic weapons system against which an adequate defense cannot now be visualized. The gloomy thought is that we must necessarily assume a comparable capability for the USSR, although one hopes their time base will be longer."

▶ **Problems**—Among other points emphasized by Gen. McCormick:

• **Nuclear propulsion** will be used for strategic and other air weapons systems "in due course."

• **Current difficulties** with automatic navigation and final target guidance devices make manned vehicles the most practical solution for the strategic bombing mission for some time to come, although eventually pilotless vehicles will replace them in substantial numbers.

• **Automatic navigation** equipment eventually will be developed that will better the precision of our present knowledge of where two points on the earth actually are located in relation to each other.

• **Current trend** in the early warning radar network is to use larger quantities of smaller radars to give more reliable coverage to the airspace at all altitudes.

• **Progress** in the advanced weapons systems development of the future requires a new type of exploration in the solid state sciences in the internal physics of matter.

Other speakers at the symposium included: C. W. LaPierre, vice president of General Electric Co. in charge of Gas Turbine Division; J. C. Garrett, president of AiResearch Corp.; Ivan Getting, president of Raytheon; Roger Lewis, Assistant Secretary of the Air Force; James H. Smith, Jr., Assistant Secretary of the Navy for Air and Al Haves, president of the International Association of Machinists.

Engine Cutbacks

Engine manufacturers last week were looking for further cutbacks in production of turbojet engines.

A thorough review of the engine procurement picture has been under way by Roger Lewis, Assistant Secretary of the Air Force for Materiel, because of revised extended estimates of the life of production jet engines.

Engineers are discovering they were pessimistic in their estimates of how long a turbojet could last. Thus, engine production schedules are overexpanded. Lewis met with procurement officials at Wright Field, Dayton, last week. From that conference decisions were expected on where cutbacks would be felt.

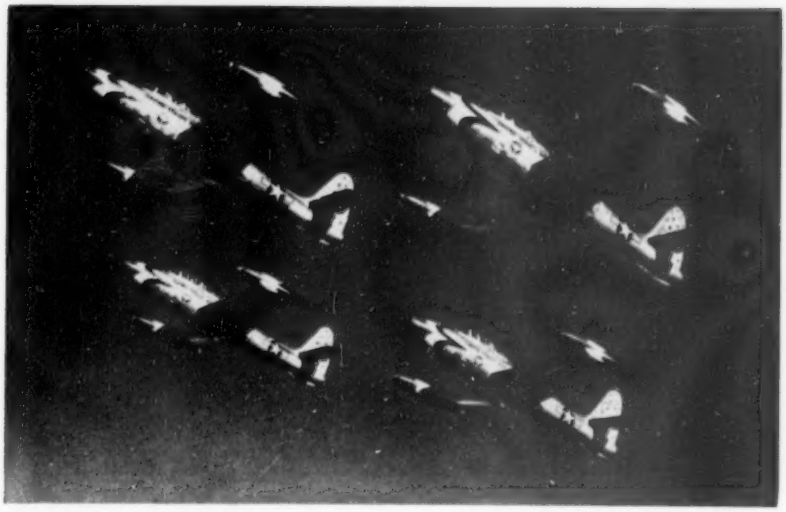
In April, Air Force ordered a $100-million cut of General Electric J47-25 turbojets, which were slated for the Boeing B-47 Stratojet production program (AVIATION WEEK Apr. 6, p. 15).

How extensive an additional engine curtailment might be could not be predicted, Lewis said, until he had conferred with Wright Field officials. It is expected an announcement will come soon.

Turboprop C-97

First turboprop Boeing Stratofreighter is expected to fly late next year. Air Force has awarded Boeing a contract to modify two C-97Gs to take P&WA T34 powerplants rated at 5,700 hp. each, a 63% increase over the present piston engines.

Turboprops will cut C-97 empty weight by nearly 5,000 lb., Boeing says.



PRECISION AEROBATICS by USAF Republic Thunderjets will be air show feature.

Dayton to Show Aviation's Best

The three-day National Aircraft Show commemorating the 50th Anniversary of Powered Flight opens Sept. 5 at James M. Cox Municipal Airport, Dayton, Ohio, with the largest industry exhibit participation scheduled since the 1946 National Aircraft Show at Cleveland.

More than 90 aircraft industry exhibitors already have signed for displays, including all U. S. powerplant manufacturers, virtually every major airframe producer and many accessory and equipment manufacturers, show officials told AVIATION WEEK.

Five large hangars originally built for a modification center in World War II will house the exhibits, which will be supplemented by a large static display of U.S. military and civic aircraft on nearby hangar aprons.

▶ **AMC Showroom**—One factor in widespread industry participation at the Dayton show is its proximity to the Air Force buying center, Air Materiel Command headquarters at nearby Wright-Patterson AFB.

The location gives industry exhibitors a chance to display their products where military users can view them.

▶ **Trophy Races**—Air Force, Navy, Marine and Army aviation participation in a four-hour flight show each day will include three world-record attempts, precision maneuver flying by three jet teams and three sponsored jet speed runs familiar to the old Cleveland National Air Race attendants: Bendix, Allison and Thompson.

Eight North American F-86F Sabres, piloted by crack test pilots will race from Edwards AFB, Calif., to Dayton for the Bendix Trophy Sept. 5.

Four Republic F-84G Thunderjets will race from Indianapolis in a simulated Air Force low-level attack on the Dayton field Sept. 6 for the Allison Trophy.

Thompson Trophy jet speed run Sept. 7 will feature a single Air Force F-86D, which will make a 100-kilometer world record attempt.

A similar three-kilometer speed run by an F-86-D will be made under General Electric Trophy sponsorship Sept. 6.

▶ **Copter Records**—An Air Force Piasecki H-21 is scheduled to make two record attempts for helicopters, an altitude climb, and a three-kilometer speed run. Both records currently are held by a Sikorsky S-52-1 at 21,215 ft. and 129.47 mph.

Another special event will be a demonstration of highspeed climb by various types of Air Force jet interceptors with afterburners, including F-86Ds, F-89Cs and F-94Cs.

▶ **FICON Demonstration**—Two demonstrations of new military air techniques will include the first public showing of the FICON operation (see p. 12) in which a Republic F-84 is carried as a parasite by a Convair RB-36 and the first showing of the new Boeing KB-47 jet tanker refueling a sister jet B-47 bomber. An in-flight refueling of a drone aircraft, a mass Marine helicopter flyby and a carrier landing demonstration will be features of the Navy and Marine show, along with formation and individual flybys by all the services.

Army's air show will feature its small liaison aircraft and helicopters.

Interesting experimental and new aircraft on display will include the Bell X-1 and X-5 research planes, the Martin XB-51 and B-57A bombers, and the Chase C-123B assault transport.

USAF Takes Bids On C-123 Production

Air Force is accepting bids for production of the Chase C-123 now that a decision has been made to build the assault transport for the Army. Bids will be opened in about a month,, Roger Lewis, Assistant Secretary of the Air Force for Materiel, told AVIATION WEEK.

He indicated that a study of bids would determine how many of the twin-engine troop carriers would be built eventually.

▶ **Kaiser Bid**—Kaiser Motors subsidiary, Chase Aircraft Co., lost the original contract when USAF canceled it in June (AVIATION WEEK June 29, p. 16). But Kaiser has been invited to submit a bid on the C-123.

That much was promised Detroit unionists by Air Force Secretary Harold Talbott last month (AVIATION WEEK July 20, p. 15) when they fought the contract cancelation because of the unemployment problem that loomed immediately.

▶ **Plant Problem**—Kaiser, however, is not certain that it can bid for the C-123 now. General Motors Corp. leased 60% of the manufacturing area of Kaiser's big Willow Run, Mich., plant after a $60-million fire wiped out GM's nearby Livonia, Mich., transmission factory.

The company is in the last stages of phasing out its canceled C-119 contract at Willow Run. It is expected to be finished within a few weeks.

Except for the C-119 production, Willow Run has been silent for some weeks because of a labor dispute with United Auto Workers (CIO). After General Motors tools up the Willow Run plant in the next few months, it expects to remain in the plant for at least a couple of years.

Helicopter Buses

A new prediction on future use of helicopters as commercial buses (AVIATION WEEK Aug. 24, p. 15) is made by Trans World Airlines vice president Thomas K. Taylor, who says copters will be carrying 1.5 million passengers in the Washington, D. C., area by 1965.

USAF Strength

USAF now has 98 operational combat wings fully equipped with aircraft and personnel, according to USAF Secretary Harold Talbott. He said one year ago Air Force strength stood at 85 completely equipped combat wings.

UAW Molds Wage-Talk Weapon

Poll of aircraft workers will be used to back union demands during negotiations with NAA next month.

By William J. Coughlin

Los Angeles—Local 887 of United Auto Workers (CIO) will use some new bargaining weapons when it begins negotiations next month with North American Aviation—weapons that could mark the beginning of a new era in aircraft labor relations.

Foremost of these is an opinion poll of union membership made recently by the local to determine the course members wish their officials to follow in the bargaining. Other new "gimmicks" may include tape recordings of worker grievances and a survey of financial status of Local 887 members.

The idea behind these modern devices is this: to lay before company representatives solid evidence that union membership is backing the demands of its leaders.

Paul Schrade, president of Local 887, believes the time has arrived in the labor movement when unions must pull their members more solidly into participation in union affairs.

The era is passing, he says, when a few labor leaders spoke for a great mass of disinterested union members who accepted benefits without taking any active part in the actual work of the union.

"These new techniques, if used right, can lift the labor movement up by its bootstraps," Schrade asserts.

▶ **Effective Instrument**—That was the original purpose of the opinion poll: to bring the membership into more active participation in union affairs, to determine what the workers at North American felt were the top issues in the forthcoming negotiations.

Attendance at membership meetings was low and the sessions were failing in their primary purpose—to discover what the members wanted.

"Our problem was how to make the union a more effective instrument for the people," Schrade says. The local hit upon the idea of a poll of the members.

▶ **Postcard Poll**—At a cost of approximately $300, questionnaires were printed and handed out at the gate of the NAA plant. These were in the form of business reply cards, which could be handed to a union steward or dropped into the mail postage paid.

Workers were asked to check off what they felt were the three most important issues from a list of issues likely to come up in the negotiations next month and also were asked for written comment on such topics as wages, severance pay and pension plans, medical programs and working conditions.

The worker was not asked to identify himself except as a member or non-member and as to job classification: supervisor, guard, welder, teamster, engineer, office worker or technical worker.

With more than 1,400 replies in, the local felt results were excellent. Usual return for such a survey is 10% or less, officers pointed out, and they had scored nearly 15%. No advance publicity had been given and no attempt was made to follow up the distribution with pleas for returns.

▶ **The Issues**—The first 1,132 cards tabulated showed these listed as the most important issues:

- **First-class pay,** 802, indicating strong membership support for the UAW-CIO's fight to eliminate the differential between aircraft and auto wages.
- **Increased holidays,** 498. North American workers this year missed out on Memorial Day and Fourth of July holidays, which fell on weekends.
- **Severance pay,** 426. Schrade believes this revealed concern over the Korean truce, with its threat of aircraft cutbacks.
- **Improved health programs,** 421. The local plans to fight for a new medical program in the bargaining sessions now pending.
- **Job reclassification,** 211. Elimination of all C and most B classifications is a union goal.
- **Union shop,** 137. Low response to what is often considered a major union objective was due to already high union membership at North American, local officers say.
- **Improved seniority system,** 117. Written comment ranged from criticism of the company's "no smoking" rule to suggestions for expanded training programs.

▶ **Evaluation**—With results of the poll in hand, union officers sat back to survey what they had learned.

"This isn't the complete answer we're looking for, of course," says Schrade. "But it gives the people the feeling they are being consulted and a chance to put their ideas before the officers. It is a step in the right direction."

The opinion poll also offers the union a chance to discover the views of the workers it does not represent at the plant, the ones who cannot attend union meetings in any event. And it has another advantage, according to officers of the local: It indicates where effort is needed to educate the members in union objectives.

"Just because the people feel a certain way doesn't mean they are always right," Schrade states.

Satsified with the success of the first poll, Local 887 plans others. One will attempt to determine the need for a severance pay-pension program, and another will seek case histories under the present medical program. Both these issues are expected to come up in the negotiations next month.

▶ **Valuable Experience**—Schrade picked up the idea of polling local members from the union education service of the University of Chicago's Industrial Relations Center. A somewhat similar survey was made by the university in cooperation with Region 6 of the Oil Workers International Union (CIO). But Schrade believes it is the first use of such a survey in the aircraft industry.

The youthful president of Local 887, who attended Clarkson Tech and Yale University, has headed the North American unit since 1951. Working with him on the survey was Al Haener, editor of the local's newspaper, who holds a master's degree from the University of Southern California.

"This survey method of getting the opinions and ideas of individual employees at NAA has been a valuable experience," Schrade told his union membership recently. "It gave thousands of people a voice in the union's wage-contract proposal. It has provided some very good ideas.

"Yet, it has done something more. Comments on this survey prove to the officers of Local 887 that most NAA employes are in support of the union and its programs. This is a comfortable feeling as we go into the first full wage-contract negotiations since 1949."

The local has other plans in its drive to increase membership participation in union affairs. This includes an increase of union stewards within the plant from the present ratio of about 1 to every 125 workers to 1 to 25.

▶ **Union Alliance**—Ideas similar to those of Local 887 are spreading. The International Association of Machinists (AFL) recently handed out a questionnaire to workers at Douglas Aircraft Co. in anticipation of fall contract talks with that company. UAW-CIO and IAM-AFL are expected to work closely this fall to coordinate strategy in wage talks at the various aircraft plants.

The UAW already has let North American know it plans to strike if necessary in its fight for new contract terms. But the approach of Local 887 serves notice of something more—a movement that may strengthen labor's hand in bargaining with all industry.

B-57 Shows Off

- **Martin-built Canberra performs for USAF.**
- **A-bomber demonstrates speed, maneuverability.**

By Alexander McSurely

Baltimore—USAF's newest A-bomb carrier, the twin-jet B-57A (Canberra) produced by Glenn L. Martin Co., this month gave a spectacular demonstration of highspeed flight and lowspeed maneuverability.

The new night intruder also displayed Martin's radical revolving bomb-bay door (AVIATION WEEK Aug. 3, p. 17) as it crossed the company's airport.

▶**First Delivery**—Watching the performance were Air Force Chief of Staff Nathan F. Twining, Air Materiel Command and Air Research and Development Command chiefs, Lt. Gens. E. W. Rawlings and Donald L. Putt, and a galaxy of other high brass from the USAF.

At its conclusion, Gen. Twining accepted delivery of the first U.S. version of Britain's Canberra from Martin president George Bunker.

Most impressive part of the flight show was the lowspeed circling of the airplane, which made a series of tight turns within the confines of the airport—utilizing the low-aspect ratio wing and the extra maneuverability it affords to good advantage.

▶**British Model**—Displayed on the ramp were the second and third Martin-built B-57As, completed and ready for flight test.

A British Canberra Mk. 2, which flew the Atlantic to serve as a model for the American-licensed planes, was parked alongside the B-57As. The Canberra, designed and built by English Electric Co., set a new altitude record of 63,688 ft. on its trans-Atlantic flight.

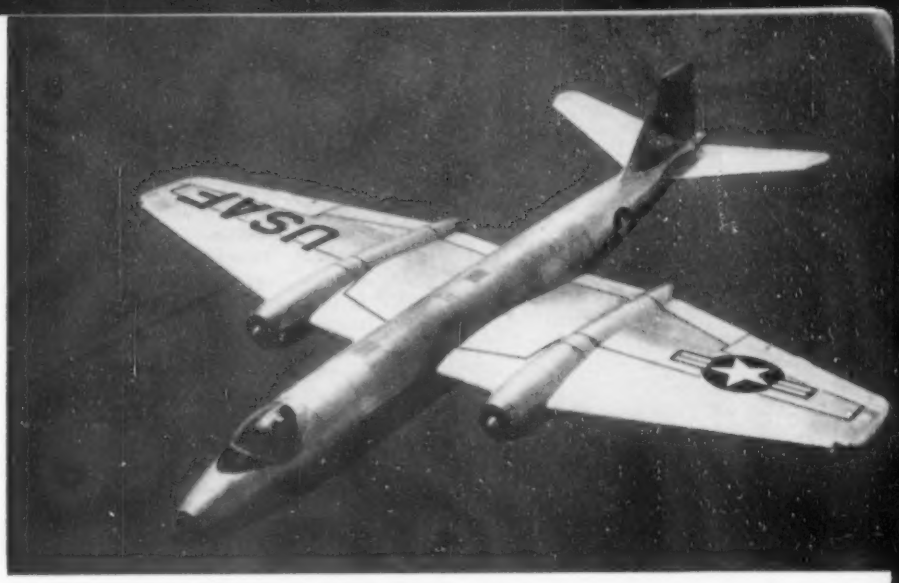
▶**Final Assembly**—In the Martin plant, 14 more B-57As are moving toward early completion on a U-shaped final assembly line.

Principal subcontract producer in the airframe program are Hudson Motor Car Co., maker of the rear fuselages, and Kaiser Metal Products Div. at Bristol, Pa., maker of the outer wing panels.

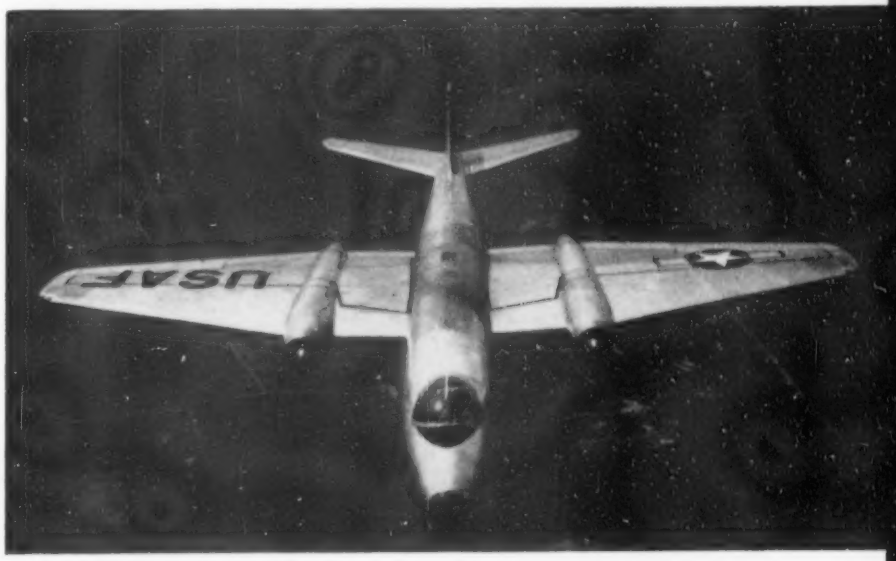
Hudson was reported ahead of schedule, and Kaiser was shooting for delivery of its 14 sets of panels to get one set ahead of schedule by Aug. 31.

▶**Buick Sapphires**—Powering the first Martin B-57A are Buick-built J65 Sapphire engines, licensed by Curtiss-Wright Corp. to Buick from Armstrong Siddeley, Ltd., the original maker.

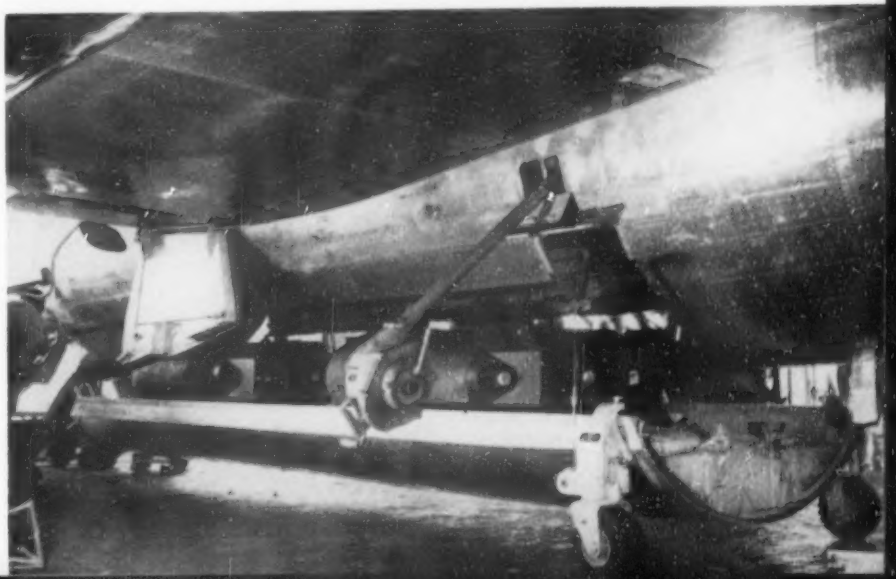
After many delays and pre-production



FIRST FLIGHT views (above and below) of Martin B-57A twin-jet night intruder show plane's close external resemblance to the British-made English Electric Canberra.



ROTATABLE BOMB DOOR on B-57A (below) is loaded prior to installation. This door allows bomb runs at high speed and cuts down turbulence of conventional open bay.



difficulties, the Sapphire programs at Curtiss-Wright and Buick are beginning to "come out of the woods," Martin officials told AVIATION WEEK.

But Martin may continue to draw engines from both sources in order to keep up with the airframe schedules. (Competing with the B-57A for Sapphire powerplants are the Republic F-84F Thunderstreak and North American FJ-3 Fury fighters.)

▶ **Comparison**—Inspection of the British and U. S. Canberras at the airport showed few obvious differences except for the "revolving door" bomb-bay and the changes due to engine installation.

The British plane is powered by Rolls-Royce Avons, slightly larger in diameter than the Sapphires.

Power ratings are quoted as 7,200 lb. thrust for the Sapphire against approximately 6,500 lb. thrust for the Avon.

G. T. Willey, Martin vice president-manufacturing, told AVIATION WEEK the bomber had been redesigned for quantity production tooling after inspection of the British Canberra line at English Electric.

▶ **Night Intruder**—Primary mission of the B-57A as a night intruder is to find, identify and destroy moving and fixed targets at night and in low-visibility periods, denying the enemy freedom of movement during these periods.

Targets are defined as:

Troop concentrations, tanks, locomotives, freight cars, boats, trucks, bridges, marshalling yards, canal locks, radar installations, aircraft on the ground and airport facilities.

▶ **Versatile Craft**—Versatility of the airplane is augumented by the new bomb door, which can be detached rapidly and refitted to provide a variety of armaments ranging from atomic bombs to rockets.

Originally designed by the British as a high-altitude radar bomber, the U. S. version could be used for this purpose or high-altitude photography with some modifications. The Canberra's superior maneuverability at high altitude would be useful against fast sweptwing fighters, its adherents point out.

Cited is an unconfirmed report of a British Canberra that easily escaped from a sweptwing F-86 pursuer at extreme altitude in recent maneuvers. Also, an Olympus-powered experimental Canberra is credited with attaining a new ceiling of 59,000 ft.

▶ **Description**—The Canberra is designed as a mid-wing monoplane with a broad wing that begins to taper outboard of the nacelles.

Landing gear is tricycle.

Tailfin is extremely small compared to most U.S. designs. The entire horizontal tail is designed to move hydraulically for variable incidence, pivoting at the leading edge.

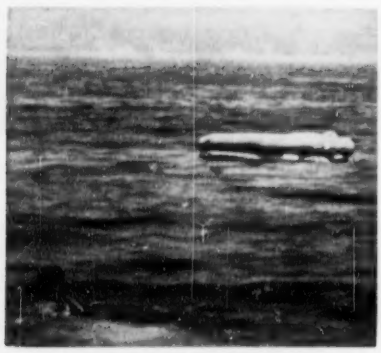
Wingspan is 65 ft., length 64 ft. and height 16 ft.

Crew includes two: pilot and a combination man who navigates, operates radar and bombsight. Usually he sits to the right and behind the pilot.

▶ **Mach Limits**—Performance and armament details have not been released by the USAF.

The British Canberra, however, has an estimated top sped of 600 mph. Estimates are that the airplane cannot go much faster regardless of power increase because of Mach limitation of the present wing.

AVIATION WEEK observers at the annual British aircraft show at Farnborough last year (AVIATION WEEK Sept. 15, 1952, p. 14) noted indications of the local shock conditions at various points on Canberras flown in the show—powered by Avons equipped with afterburners and by Olympus engines—when the planes made highspeed passes across the field.



NAVION LIFEGUARD

Small Navion four-place personal plane has been adapted for air rescue mission by its owner, Douglas Aircraft Co., to safeguard company test pilots who may be forced down while flying over water. Plane has a life raft fitted to the bottom of the fuselage. Raft can be dropped near downed pilot by turning a release handle in the cockpit. The raft unfolds and inflates as it falls free (top view). Bottom photo shows pilot (lower left) swimming towards inflated raft during practice.

Missile Team

A nine-member Defense Department team, headed by Trevor Gardner, special assistant to the Secretary of the Air Force, expects to complete an evaluation of the guided missiles programs of the three services in about two months.

In addition to Gardner, who was appointed by Defense Secretary Charles E. Wilson to head the group, which has been at work two months, the team includes:

Rear Adm. John Sides and Capt. William S. Rayburn, director and assistant director of guided missiles, respectively, representing the Navy.

Maj. Gen. Donald Yates, director of research and development, and Col. Robert Johnston, technical executive, representing the Air Force.

Brig. Gen. K. F. Hertford, deputy assistant chief of staff for research and development, and Brig. Gen. Harry Roper, deputy assistant chief of staff for operations for research requirements and special weapons, representing the Army.

Dr. Thomas Thompson, former vice chairman of the now-defunct Research and Development Board, and Fred Marvin, former chairman of the Guided Missiles Committee of the same board, representing the Office of the Secretary of Defense.

Aviation Pioneers Receive AF Awards

Three pioneers in the aircraft industry have received the USAF Exceptional Service Award, highest civilian honor given for non-combat service:

• **Frederick Brant Rentschler,** chairman of the United Aircraft Corp. received the award of the Air Force Assn. convention from Air Force Secretary Harold Talbott for "helping the U. S. recover its lost ground in the field of jet propulsion."

• **Donald Wills Douglas,** president of Douglas Aircraft Co., Inc., was given the award for his contributions in developing combat and transport aircraft during the past 40 years.

• **James Howard Kindelberger,** chairman of the board of North American Aviation, Inc., was honored for his aviation achievements, "stretching from the Jenny to the jet," and particularly for the work of the F-86 Sabre in rebuffing the challenge of the MiG-15 in Korea.

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New B-47s

- **AF gets two Stratojets for photo reconnaissance.**
- **RB-47B is dual purpose, RB-47E strictly camera.**

U. S. Air Force is taking delivery of two new versions of the 600-mph.-plus sweptwing six-jet Boeing Stratojet bomber. Both are designed to carry out high-altitude, day-or-night photo reconnaissance missions.

One model is the RB-47E manufactured by Boeing Airplane Co.'s Wichita Div.; the other is a modification of the B-47B– designated RB-47B–turned out by Grand Central Aircraft Corp., Tucson, Ariz.

▶ **RB-47E**—This version is strictly a photo plane. It features a longer nose than the B-47E bombers turned out by Boeing - Wichita, Lockheed - Marietta and Douglas-Tulsa. The new nose carries a number of cameras in an air conditioned compartment.

Equipment includes:

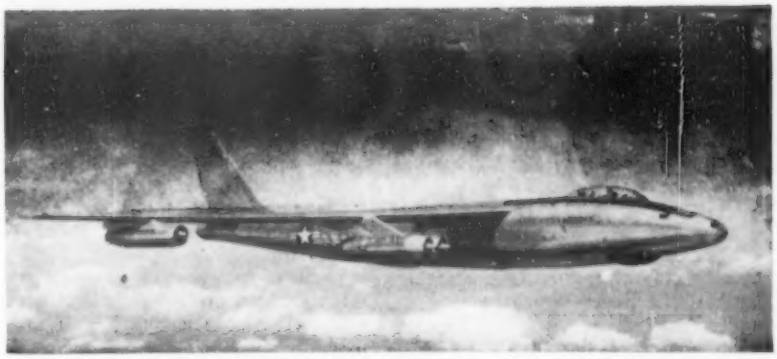
- **Intervalometers** that make it possible to take photographs of large areas at regularly spaced intervals.
- **Optical viewfinder.**
- **Photocell-operated shutters** actuated by flash lighting for night photography.

Like other Stratojets, the RB-47E has a three-man crew, the "triple-threat" observer-navigator-bombardier is replaced by a photographer-navigator.

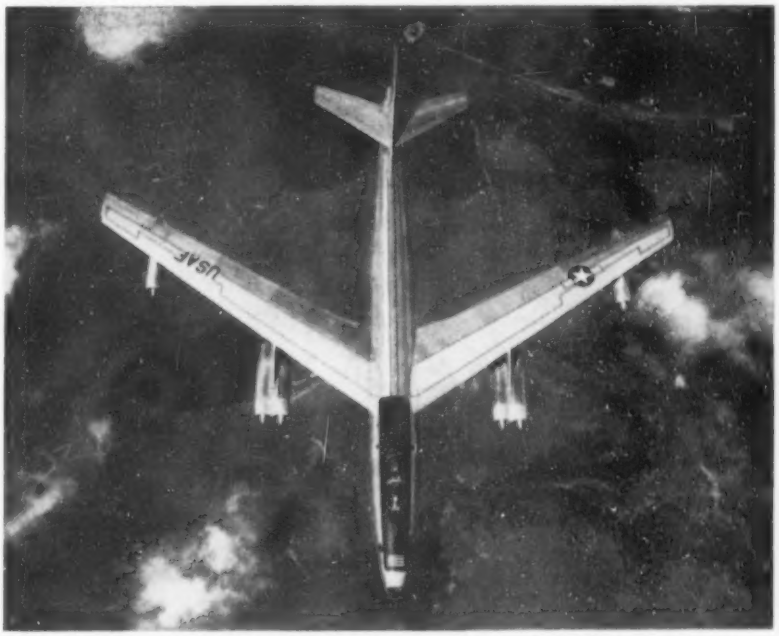
▶ **RB-47B.**—This modification is a dual-purpose bomber-camera plane.

It features a structurally modified bomb-bay that can take a pod comprising a complete camera installation. The RB-47B's hot air ducting is modified to maintain the proper temperatures for the pod. Aeronca Mfg. Corp., Middleton, Ohio, built the camera packages to Boeing specifications.

This version of the Stratojet can be converted from a bomber to camera plane by removing the bomb-bay doors, attaching the pod to standard door and bomb-bay fittings and connecting heat and electrical lines to the plane's system. The pod contains eight cameras. Conversion to bomber configuration is equally rapid.



BOEING RB-47E camera plane (foreground) flying with B-47E bomber. Note longer nose on RB-47E compared with that on B-47E. Both planes have radar-directed tail gun turrets.



PLAN VIEW of RB-47E Stratojet provides a good look at the 600-mph.-plus plane's sweptwing configuration. This model of the aircraft carries cameras in its nose.

CLOSEUP OF RB-47E camera nose with B-47E bomber in immediate background points up differences in planes. Arrows indicate: (1) cooling unit inlet, (2) inverter ventilation inlet.

DH Halts Drover

(McGraw-Hill World News)

Sydney—Production of the six-to-nine-passenger Drover tri-motor transport has been halted by the de Havilland Aircraft Pty., Ltd., at Bankstown near Sydney. Space used for Dover output has been converted to assembly of DH Vampire jet trainers.

AF Completes Civilian Command

Nine new Deputy Assistant Secretaries are appointed to materiel and management, boosting top chiefs to 16.

Nine new Deputy Assistant Secretaries have been designated, completing Air Force's top civilian command that now adds up to 16 secretary-level chiefs.

Four of the Deputy Assistant Secretaries serve under Assistant Secretary for Materiel Roger Lewis, and five are under Assistant Secretary for Management H. Lee White.

The four under Lewis:

• **Deputy for Procurement and Production,** Max Golden. He formerly handled procurement matters for former Undersecretary Roswell Gilpatric, was a New Jersey attorney.

• **Deputy for Materiel Programs,** Myron Tracy. A career government employe, he served as chief of the office of aircraft programs in the Munitions Board until it was abolished recently. During World War II, Tracy was an industrial specialist with the War Production Board, later served on the Strategic Bombing Survey Mission to Europe and subsequently became assistant executive secretary of the Air Coordinating Committee.

• **Deputy for Mutual Security Assistance Affairs,** Charles Shuff. During World War II, he served as an Air Corps pilot and engineering officer, later became national sales development manager for Eastern Air Lines.

• **Deputy for Civil Aviation,** Bradley Nash. He served during World War II as financial advisor to the War Production Board, also was economic consultant to the National Security Resources Board and recently was appointed consultant on President Eisenhower's Advisory Committee on Government Organization, which recommended reorganization of the Defense Department.

The Five Deputy Assistant Secretaries under White:

• **Deputy for Contract Financing,** Chester Seftenberg. He has had authority over guaranteed loans to industry and other types of Air Force financing since 1950. Lawyer and banker, Seftenberg served as deputy chief of management control of the Air Materiel Command under the late Lt. Gen. William Knudsen during World War II. He is a former vice president of the First and American National Bank of Duluth and former president of the Wisconsin Trust Companies Assn.

• **Deputy for Accounting and Financial Management,** Robert Benson. His job will include auditing all USAF contracts. An accountant, Benson was a partner in the Kansas accounting firm of Willems and Benson. During World War II, he served at Wright-Patterson AFB as chief of the fixed-price audits branch and chief of the termination audits branch.

• **Deputy for Budget and Program Management,** Hyde Gillette. A graduate of Princeton and of Harvard business school, Gillette is a partner in the New York and Chicago investment banking firm, Glore, Forgan, and Co. During World War II, he served as a Naval officer, handling ordnance procurement and materiel matters in the Office of the Secretary of the Navy.

• **Deputy for Manpower,** James Goode. A Connecticut attorney, he has served eight years with the Securities Exchange Commission. During the war, he served as chief of personnel in the Air Force Training Command.

• **Deputy for Reserve Affairs,** Chester Seftenberg. He also is filling the post of Deputy for Contract Financing.

FBI Arrests Suspect In Plane Parts Ring

Federal Bureau of Investigation arrested a Seattle man described as a "former dealer in surplus airplane parts" in connection with a Civil Aeronautics Administration probe into what may be a nation-wide ring dealing in illegal unairworthy commercial aircraft parts.

The man is charged with forging the name of an authorized CAA inspector to a form required for approval for use of a crankshaft for a Pratt & Whitney engine.

Two engine crankshafts considered unairworthy because of pits and flaws, which had been covered with solder, have been recovered, the FBI has reported.

Officials have been investigating to determine whether vital engine parts sold by Air Force for salvage are being peddled to unsuspecting operators of commercial aircraft.

One source indicated there is reason to believe such dealings are widespread and may involve hundreds of thousands of dollars.

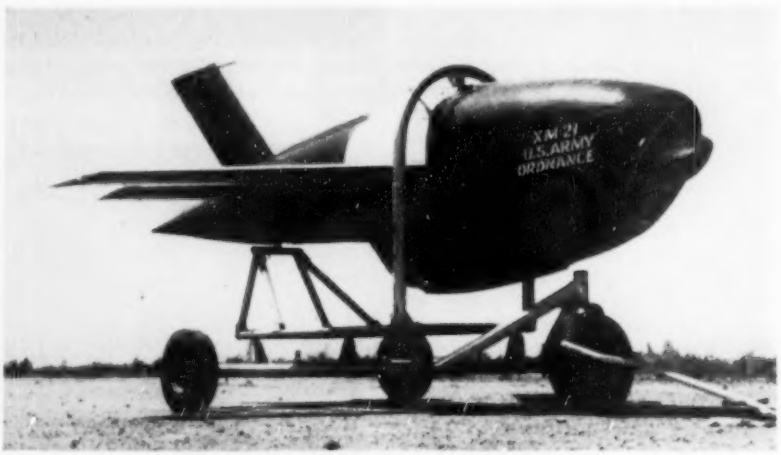
YH-21 May Be First Copter at North Pole

Military authorities are speculating that two Piasecki YH-21 winterized helicopters sent to Thule AFB, Greenland, may be the first copters to fly over the North Pole.

The YH-21s will undergo two months of Arctic field tests at Thule to determine their operational capacity in the frigid zone for which they were designed.

The helicopters were flown this month out of Eglin AFB, Fla., where they have been undergoing tests in a refrigerated hangar (AVIATION WEEK Mar. 9, p. 9). The flight from Florida to Greenland was expected to take 15 days.

Crews were briefed on Arctic flying at Westover AFB, Mass.



TRAINING TARGET FOR MISSILES

U. S. Army Ordnance has ordered production models of the Ryan XM-21 Firebee for training anti-aircraft units in use of Skysweeper gun and Nike and other ground-to-air missiles. Here a Firebee in Army markings is seen mounted on a dolly. The highspeed Firebee can be maneuvered to simulate enemy aircraft. It is powered by a Fairchild J44 monocoque turbojet of approximately 1,000 lb. thrust. It takes off from a platform assisted by jettisonable rocket motor. Deliveries of the Firebee to the Army are expected to be made later this year.

Are retained lubrication and long bearing life vital?

here's how leading harvesting machine manufacturers secure them with NEEDLE BEARINGS

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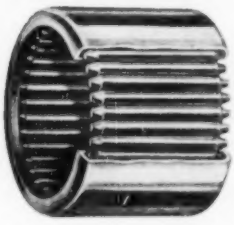

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AF Tests Rocket Engines in Giant Stands

By David A. Anderton

Edwards, Calif.—At the speeds expected of tomorrow's missiles, half a million pounds thrust means two or three or four million horsepower.

No ordinary test stand could handle such an astronomical output. That is why there are two extraordinary rocket engine test stands anchored in the granite Leuhman Ridge at the Air Force Flight Test Center.

Three thousand feet above the sea, overlooking the Mojave Desert, the dazzling white concrete and aluminum buildings of the Experimental Rocket Engine Test Station are spread over a sloping plateau. Topping the platform are the giant test stands firmly anchored onto the granite summit ridges.

It is hard to appreciate the size of the test stands when they are seen through Joshua trees that flank the road up from the dry lake bed. They are dwarfed by the mountain that cradles them.

▶**Granite Monuments**—Seen again from the ridge top above the flame pits and fuel storage tanks and the motor and pumps they look like huge granite monuments. You walk out on steel gratings, duck under a pipe and step over cables as you work your way toward the valley side of the stand.

Casually leaning against the railing, Don Dienst, chief of the Test Operations Section, says, "Down there is the flame pit." You walk to the edge, look over the railing—and brief sensation of vertigo hits you.

"Down there" is over a hundred feet below, and it's a pit floored with concrete, sided with huge boulders. Between it and you is a solitary steel grating and a pipe railing.

Then you realize just how big these test stands are.

They've got to be big, of course. A test stand designed to handle half a million pounds of thrust has to be big.

That was one of the reasons the stands were built by the Air Force. The reasoning was that if any contractor were to build and operate such a huge facility—financed by the Air Force, of course—the mere possession of the test stand would give him the inside track, if not the only car in the race, when it came to getting contracts for high-thrust rocket engines.

So in 1946 the powerplant lab at Wright-Patterson decided the only solution was to have the Air Force build and operate the stands for use by all civilian contractors.

▶**Design and Installation**—The site was chosen in 1947. Complete design and installation of the facility was turned over to the Aerojet Engineering Corp. Their first job was to develop a set of design criteria. These were circulated to industry for comment and suggestion. The same specs went to various Air Force installations.

Aerojet reviewed all the kicks and kudos, then rephrased their design specs. Construction began in 1949, with the U. S. Army Corps of Engineers pouring concrete and welding steel.

Current Status

The first hot run was in July 1952, and the first high-thrust test was made last November. Both stands are now in operation, and in mid-June the station was working a 20-hr., six-day week on a split-shift basis.

▶**Assigned From WADC**—The work load and projects are assigned from the Wright Air Development Center. Although the formal statement of the mission places equal stress on "in-shop" research and development, and service to contractors, the general feeling at the test station is that the primary job is service.

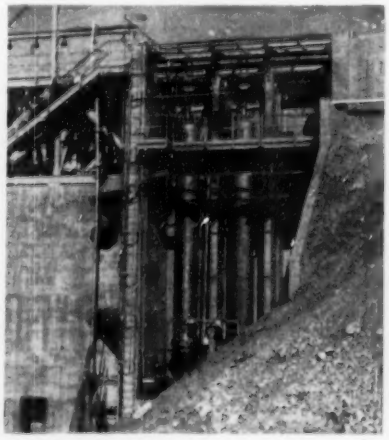
There were two major projects at the station during mid-June: Motors for Boeing's Bomarc and North American's Navajo. When you discover both stands are tied up by these tests a large part of the time, and see the quantities of space occupied by the two contractors in shops, administration buildings and test-stand shops, you begin to agree service is the No. 1 job.

Test Stands

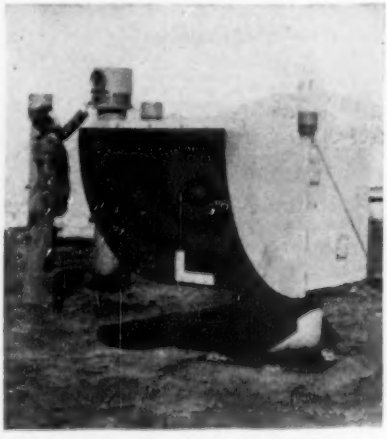
Flanking the common control room the test stands rise out of the ridge like Tibetan temples.

"Imagine what it's going to be like in a couple of thousand years," said one observer, "When some archeologist explores this station, and tries to figure out the religious practices of the 20th Century from one of its larger temples."

MODEL of Edwards' rocket test stands.



FUEL and oxidizer storage tanks.



PERISCOPES for viewing test firings.

► **Construction**—Backbone of the stands are paired 36-in. wide flange steel I-beams which tie vertically into concrete anchors deep in the fractured granite of the ridge.

Steel and concrete are in turn tied into the major bulk of the structure, hundreds of tons of reinforced concrete keyed into the shelved stone by pressure-grouting.

In some places the concrete, which was forced into the sub-structure under pressure, has penetrated 300 ft. below the surface.

► **Appearance**—The general design of the stands is a monolith with side bays for propellants, and a cantilevered platform several stories high jutting out near the top. Up here the motor and tanks and associated plumbing are mounted.

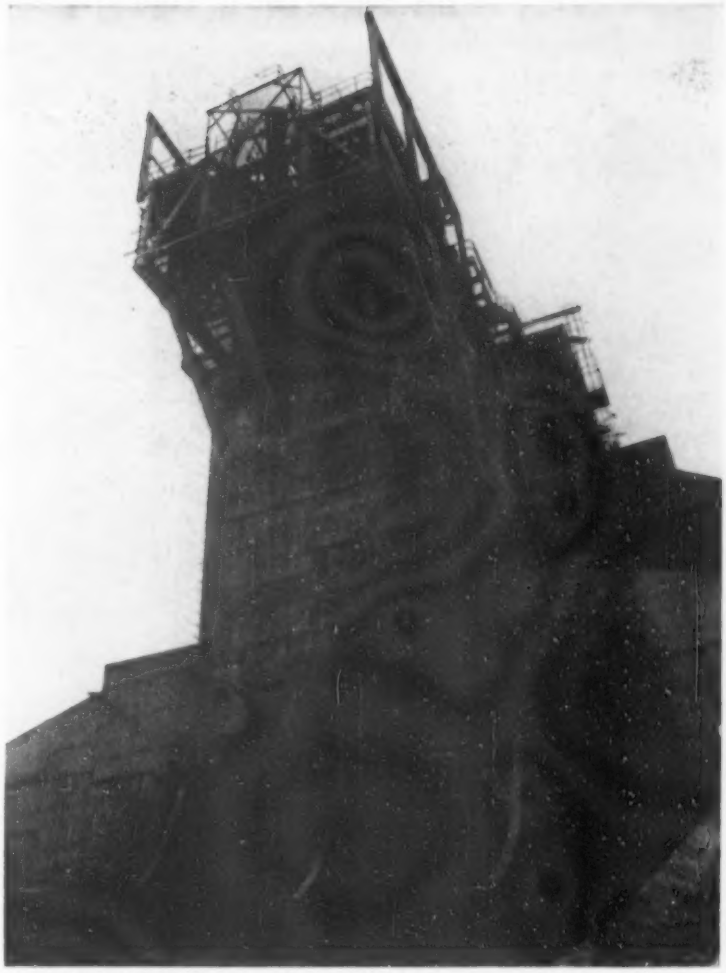
During a test, the flame from the rocket engine drives vertically into the flame pit far below. "The concrete in the pit spalls in three or four minutes of testing with 50,000 lb. thrust," said Dienst.

Located all over the stand are nozzles for washdown or fire protection. Wide open, they can pour a drenching 4,000 gal. per minute to flush fire and corrosive fuels into the valley.

► **Propellant Tanks**—In high bays to left and right of the stand are propellants, stored in stainless steel tanks which are hung for weighing to determine fuel flow. The tanks weigh 11 tons each, empty; there are two on a side. Capacity is 157 cu. ft. of liquid at an operating pressure of 1,100 psi. Wall thickness of the tanks is one and nine-thirty-seconds of an inch.

At the entrance to each of the stands is a small shop, called the test stand shop. Its construction is unique, because it's designed to fail partially in the event of an explosion on the test stand. The frame work of the shop is heavy steel I-beams; strapped to these are corrugated sheets. A blast will remove the sheet and leave the structure.

WARNING LIGHTS help clear the area.



HUGE TEST STAND takes rocket engine between two angular concrete braces at top. Rocket exhaust blasts down into flame pit at bottom center of picture.

Control Room

Steel doors at right angles, thick concrete walls and tiny windows with steel blast shields protect the control room, the nerve—and personnel—center during a test run.

► **Firing Details**—Here in this air conditioned room are the firing circuits, all recording and observation equipment used during tests. Directly in the center of the layout are the banks of recorders, prefabricated in panels by Aerojet, disassembled and reassembled here.

On opposite sides of this phalanx of instrumentation are the firing consoles, faced with banks of toggle switches for the multitude of circuits that must be activated in sequence to fire a rocket engine.

Between recording equipment and consoles are periscopes—a total of six in the room—which can be turned to either stand for direct observation of the firing.

Typical Test

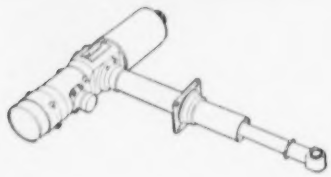
Rocket engine tests have a characteristic monotony about them. If you've seen one, you've seen them all. The flame may be longer, the noise louder, or the fire brighter, but the same pattern runs through test after test.

First, the warnings. At this station there is a four-light warning system, looking like traffic lights everywhere you travel through the station. When the green light is on, the entire area is open.

► **Danger Zone**—Area-clearing starts with the general amber signal, and everybody who doesn't have business during the tests gets out to one of the safe zones. The station is zoned for safety. "We dropped some shrapnel 2,000 ft. away once after a good blowup. It's probably safe beyond that distance."

Clearing under amber takes about 15 minutes; then the general red signal goes on. Nobody moves except the fir-

Airborne Actuator for the Sturdy Savage



Tiny but essential—that's the LINEATOR® Electric Linear Actuator. Huge but handy—that's North American's new XA2J-1 Savage. Combined, they do a job for the Navy.

The R-144 M16 Lineator is used as the actuator in a temperature control system furnished by Airborne. Other models and similar Airborne electromechanical units are standard equipment in many Service and civilian aircraft. You'll find data on Lineators and other Airborne actuators, motors and ANGLgears in the Engineering Catalog of the Institute of the Aeronautical Sciences. We invite inquiries.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue
Hillside 5, New Jersey

ing personnel who take over in the control area.

► **Observation**—Down on the floor of the valley, a little yellow M-5 tank—the only tank in the Air Force—crawls toward the flame pit. With turret removed, it has been converted into a mobile observation post for two men. It can stand around where the outside air temperature is 500F and not bother the observers inside.

Two minutes later the starting groan of the siren winds up to an undulating screech, and inside the control room the countdown begins.

Firing starts on the marker's "Zero, FIRE!" of the countdown, and from then on, ". . . the gods take over. . . ." as one engineer said.

A successful firing is followed by a general green signal again, with amber on the test stand only. If the rocket burns or blows instead of blasting, the emergency red signal—controlled by a fireman on standby from the station—shows and immediately there is considerable activity.

Instruments, Gadgets

The quantities of electronic recorders and instruments in the control room are staggering at first glance. Bank on bank of Speedomax, Brown and Wiancko labels surround indicator light boards, which tell the status of recorders, whether on standby or operating.

► **Complex Wiring**—The cabinet chassis which contain these remote readers are arranged in a hollow rectangle, with the space inside taken up with wiring and additional shelving for more instrumentation. When you look behind one of these sides, it reminds you of the back of a large dial telephone exchange.

Wires—hundreds of wires, thousands of feet of wires—run singly and in tied trunks in an impressionist pattern in three dimensions.

Coding wires in such a maze is an absolute must. Over in one corner is a little gadget called the Kingsley stamping machine. "Worth its weight in gold," said one technician. "It'll run half a mile of wire through in about five minutes and stamp it every ten inches with a number."

The next step in instrumentation will be the installation of television for direct observation of the firing and the flame pattern. Windows and periscopes used now have limitations; so does television, but the combination of all three systems should give effective results.

Future Plans

The test station is still expanding. Next year, the staff hopes, they'll be able to begin the construction of an assistant takeoff stand. This unit will be used to check out Rato units for planes in four bays at once.

In the future, the two big stands will be joined by a third. A hydro-dynamics lab will be erected for the upkeep of the stand fluid-handling equipment.

► **The Big One**—Then sometime later, the station hopes to have a "larger test stand." Design studies on this behemoth are being developed now by Aerojet and North American. Presently it is visualized as a stand which will be able to mount the largest foreseeable missile complete and give it a preflight check under full thrust.

The station staff is also considering construction of a pre-test stand where they would run cold-flow studies on motors, or perhaps check igniter systems. This would be a useful piece of equipment to save much time on the main stands by performing a large number of checks before the hot runs.

► **Utilization**—One of the big worries Dienst and his associates share is utilization of the test stands in the future as work loads increase. Right now, most of the time on the stand is spent getting ready for the actual firing, which may last from a few seconds to about a minute. Hours of preparation precedes this short firing.

They have tested two engines on a single stand at the same time, and they feel that—if they had to—that number could go to ten at once. But even multiple firings would not compensate for the makeready time.

Dienst said that considerable engineering effort is going into utilization studies, and that the answer seems to lie in developing a quick-disconnect technique for rocket engines.

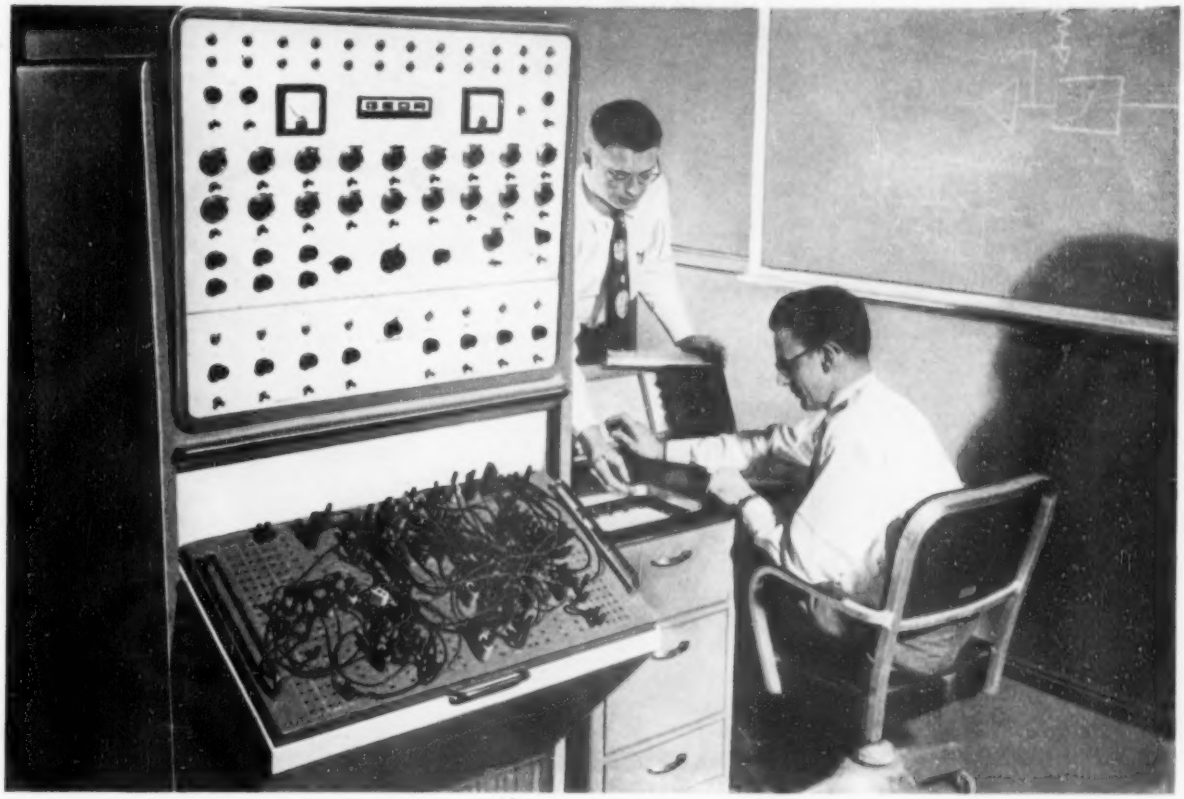
"We'd like to be able to hook them up, fire, unhook and wheel some more into the test cell just as fast as we can move engines around. When we can do that, we'll really be able to find out something about rocket engines."

Added Starter

Douglas Aircraft Co.'s El Segundo Div. has added a new aircraft starter to the growing list now available. The Douglas unit is a portable, self-contained gas turbine compressor that is housed in a detachable wing unit for ferrying by aircraft to forward bases where it is disengaged and used as a ground starter. It increases the payload of combat planes by eliminating the need to carry heavy built-in starters on missions.

The portable compressor is now used in the F4D Skyshark and the A3D twin-jet bomber, Douglas reports.

BEST WAY TO GIVE YOUR HUNCH A CHANCE



ENGINEERING processes are undergoing a revolution, thanks to GEDA—the Goodyear Electronic Differential Analyzer — a compact analog computer which greatly accelerates the design of complicated equipment and systems.

A big advantage of GEDA is the fact that engineers do not have to learn specialized mathematics in order to use the computer. Once the block diagram is laid out, it is a simple matter to set it up on GEDA's problem board.

The results are shown graphically. Consequently, GEDA provides the engineer with a better understanding of the system under study because the solutions are produced in a form already familiar to him.

So now he is encouraged to "play his hunches." A new idea can be tried out or a component of a system can be changed so easily that new approaches to a problem can at last be profitably explored. Even problems dealing with dynamic systems, where conventional solutions seem impossible or too time-consuming, can be solved by GEDA.

The GEDA line of equipment includes both linear and nonlinear analyzers, six-channel console recorders, and curve-followers—offering flexibility and scope to meet specific individual requirements.

WRITE FOR BROCHURE and details: Goodyear Aircraft Corporation, Dept. D-65A, Akron 15, Ohio — for over five years a major supplier of computing equipment, operator of one of the world's largest computer application laboratories.

OPPORTUNITIES UNLIMITED for engineers!

Goodyear Aircraft has many opportunities in research, design development and production of ELECTRONIC COMPUTERS • AIRCRAFT • AIRSHIPS • HELICOPTERS • GUIDED MISSILES • AIRCRAFT COMPONENTS • TRANSPARENT ENCLOSURES • RADOMES • BONDED SANDWICH STRUCTURES • RADAR • WHEELS AND BRAKES — and in many other allied fields.

Submit brief resumé of your qualifications and experience, or write today for application blank and further information. Address: Dr. K. Arnstein, Vice President of Engineering, Goodyear Aircraft Corporation, Akron 15, Ohio.

GOODYEAR AIRCRAFT

GEDA—T. M. Goodyear Aircraft Corporation, Akron 15, Ohio

"Plug-in, plug-out" simplicity in Avien's "TWO-UNIT" FUEL GAGE

This "repackaging" of Avien's capacitance-type fuel gage is 50% lighter and needs no field adjusting.

Up until now, most fuel gaging systems needed four units: a tank unit, an indicator, a bridge-amplifier and a shockmount.

No field calibration was required for the Avien tank unit or indicator. Avien held them to such close tolerances, the adjustments for individual installations were actually "built-in."

The bridge-amplifier (the "black box") was a different story. This intermediate unit was supplied as a common part, for universal application. And that's where field calibration *had* to be made.

There was only one answer, as far as Avien was concerned. The "black box" had to go.

Now, in the Avien Two-Unit system, the necessary components for the bridge and amplifier functions have been built into the indicator case. The "black box" is eliminated, and so are many parts which were necessary to make the "black box" universally applicable.

The Two-Unit Gage gets installation down to "plug-in, plug-out" simplicity. No more field calibration is necessary – and that means that all units designed for the same aircraft are interchangeable. Avien units are now all "shelf items."

To install the Two-Unit Gage, you *don't* need trained personnel, you *don't* need specialized equipment, and you *don't* need calibration instruction or data.

This new "package" brings savings all along the line. The basic system is reduced in weight by 50%. Installation time is cut. Less wiring and connectors are needed. Less maintenance is required. Trouble-shooting becomes easier. And fewer parts must be stocked for maintenance and repair.

As in the previous system, additional functions for fuel management can be integrated into the basic gage – and with less complexity than ever.

The Avien Two-Unit Gage is now available to meet your manufacturing schedules. The indicator is available in either large or small sizes, with all varieties of dial configurations.

Every month, Avien produces over ten thousand major instrument components for the aviation industry.

We believe that Avien's Two-Unit Gage will contribute to the obsolescence of many earlier systems, including our own. For further information, write or call us.

Avien

AVIATION ENGINEERING DIVISION

AVIEN-KNICKERBOCKER, INC.

58-15 NORTHERN BOULEVARD, WOODSIDE, L. I., N. Y.

Roto-Finish Tumbling Machines Save Money

Thousands of dollars are being saved by a battery of four Rotor-Finish tumbling machines recently installed at Ryan Aeronautical Co., San Diego.

An analysis of the first two months of operation indicates that on deburring operations for jet and piston engine parts, as much as $100,000 may be saved annually with the present average work load.

▶ **Eliminates Sandblasting**—The tumblers also are being used to remove surface corrosion, fused weld flux and heat-treat scale, eliminating the need for the slower sandblasting method.

Grinding chips (stones) are stored in large bins and fed into hoist pans. A crane lifts the pan and inserts its nose into the tumbling machine opening. A detergent compound in water also is poured into the cylinder.

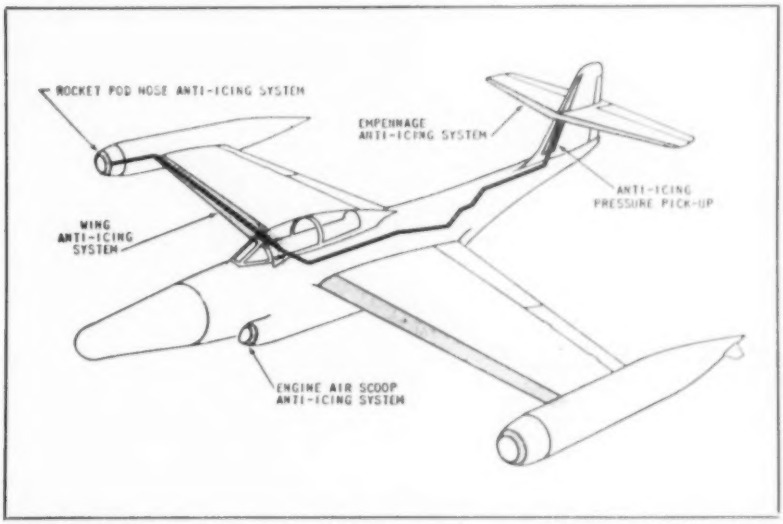
▶ **Bright Finish**—Many of the detergents are obtained from the tumbling machine manufacturer. But for removal of fused welded flux and for particularly bright finish on stainless steel parts, Ryan has developed its own compound—Raco 210—a formulation of acids and wetting agents.

An automatic timer stops the tumbler at given rotation times, and the parts and chips are unloaded into the hoist pan.

The tumble-cleaned parts are segregated from the chips in a mechanical separator, and the chips then screened for size.

AF Orders Mobility Boxes

Air Force contract for production of a limited quantity of Becker & Becker mobile supply containers (AVIATION WEEK July 13, p. 55) was won by the Multiple Breaker Co., Boston, Mass., in open bid competition. The containers are designed to improve mobility of USAF units.



SCORPION anti-icing schematic details ducting from jet engine to wings and tail.

Thermal Anti-Icing Shields F-89

Northrop Aircraft engineers have developed a "highly effective" thermal anti-icing system for the F-89D Scorpion rocket-armed all-weather fighter.

The system takes care of the Scorpion's wings, empennage, wingtip rocket pods, windshield, leading edges of engine intake ducts and forward frame components within the ducts.

▶ **Engine Protection**—The airframe leading edge and powerplant component system utilize high temperature air bled from compressors in the fighter's twin Allison J35-A-35 jet engines. Ducting takes the air to proper locations (see schematic of F-89 above).

The engines receive additional icing protection by installation of screens that retract automatically whenever the plane is airborne or if icing conditions prevail while the craft is on the ground.

▶ **Windshield Safeguard**—Electrical resistance heating is employed to safeguard the windshield, fuel vents and other sections.

The windshield uses a transparent electrical heating unit on each side of the glass to take care of anti-icing on the exterior and anti-fogging inside. In normal flight both elements are heated continuously.

The pilot can step up the heat output of the outside element in case of emergency.

WHEN THE PRESSURE IS ON

only an ADAMS-RITE lock will do...

NO. 1607 LOCK ASSEMBLY

This flush-type exterior lock has been designed for use in a turbo-prop transport. Withstands pressure of 18.5 PSI and provides positive security with rugged convenience. Button releases handle which rotates in either direction to open. Inside handle supplied. Length 9⅛" overall. Weight approximately 2 pounds.

NO. 1563 LOCK ASSEMBLY

Developed by Adams-Rite for newest twin-engine trainers. Flush type with 5 pin tumbler cylinder. Button ejects handle which rotates clockwise to open. Assembly is pressure sealed to customer specification. Length 8⅞" overall. Weight approximately 1.3 pounds.

NO. 876 AUXILIARY DEADLOCK

This is one of the first pressured locks developed by Adams-Rite for a famous four-engine super transport. Still in use in the latest production airplanes. Unlocks from outside by key only; handle always operates lock from inside. Overall diameter 2¹⁵⁄₁₆". Weight 8 pounds.

NO. 1566 CYLINDER

Four pin-tumbler construction for use on one of latest flying boats. Although not pressurized, this cylinder is made throughout of solid stainless steel for salt water exposure and is used on a pressurized door.

The Adams-Rite locks shown above are only a few samples of many custom-designed locks now being made. for door bolting systems—emergency exit locks—exterior door locks—bulkhead door locks and other closing devices—**ask Adams-Rite**—headquarters for locks.

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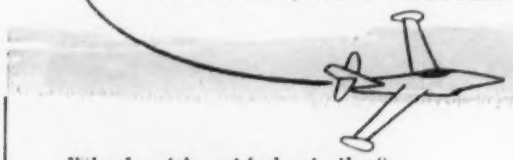
Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.



What's with guided missiles?

Are they failures to date, as some contend, or are they the fantastic successes others boast?

The answer lies somewhere along the middle line, I'm convinced.

Trouble is, developments are so highly classified, it's difficult to learn just where we stand.

Public confusion on the science stems basically from this over-all secrecy, from sharp inter-service rivalry, from exaggerations ballooned by theory and imagination, from caustic needles by inexpert critics.

The wild predictions of a few years ago have died away, fortunately, and the term "push button warfare" has been relegated largely to pulp fiction and the comic pages.

The early missiles have long since gone by the boards, although their pictures still show up because there's no art available on new developments—and precious little information. And some of us are adopting an understandably cynical rule-of-thumb: "If it's publicized, it's already ancient."

I have no quarrel with security, other than the irksomeness of it when a secret obviously is no longer a secret. But I do think the American public should be given some straight general information on what it is getting for its money. After all, it's nothing that the foreign experts don't know.

As for service rivalry, it has had both a good and a bad effect, in my opinion. Certainly no one service can be condemned for pushing its own research into this esoteric realm of hypersonic aerodynamics. The Air Force, the Navy and the Army realized that missiles will play a vast and important part in future combat and no one intends to be left behind.

There has been much made of duplication. It has been costly—and in light of hindsight, unnecessary. But service rivalry pushed competition and speeded progress. Even in view of duplications it would have been stupidly hazardous to entrust development in such a vital field to but one service, to succeed or fail.

Now that a top government agency is evaluating, coordinating, guiding the three services in development work, the overlap should disappear.

Right here it might be well to point out that missiles can never entirely replace combat planes, nor can they entirely supplant cannon. Even with long range guided weapons, there will have to be real or threatened aircraft assaults, reconnaissance, etc. There will always be a demand for day fighters to help clear the skies and for interceptors to knock down bombers that sneak through our missile barrages.

Where do we stand today in missile development?

We have achieved some solid successes in short range missiles such as ground-to-air and air-to-air weapons. At least several pilot friends of mine have been deeply impressed—and perhaps a little green—after seeing films of what these vicious blasters can do in tracking and disintegrating fast, high-flying airplanes.

In the medium range ground-to-ground missiles, I believe we are on the threshold of success, and here I mean the supersonic stuff, not the slow robot plane variety. The ranges achieved by test vehicles—and the accuracy, too—have been remarkable.

As for intercontinental missiles, they are still some way off. Even so the results achieved, in comparison with the problems overcome, are amazing. The weapons now under test, or about to go into test, are astounding in scope, frightening in potentiality.

In all cases, of course, guidance has been the greatest barrier to success, particularly in the intercontinental types where the tiniest error over extreme ranges can waste a missile. Reliability is the big factor sought in guidance, along with comparative simplicity that will enable military crews—other than Ph.D.'s—to maintain and launch the weapons.

Based on what I've heard, read and stumbled across, I say there is little reason for criticism and every reason for praise. The missile people plunged into a virtual vortex of unknowns—competing against outlandish predictions—and came up with answers which today are paying off and paving the way for more astonishing weapons of the future.

We must have them. May we never have to use them.

Nickel-Iron Battery Is Cheaper, Simpler

A compact nickel-iron, dry-cell storage battery is being finalized for production which will reportedly overcome shortcomings of the lead-acid type.

Developed by Alkaline Battery Corp., it is said to be less costly than the nickel-cadmium and silver-cadmium dry cells introduced over the past few years. Saving in terms of raw materials alone is estimated at about five cents per pound. Inventor of the unit is ABC's vice president Paul D. Payne, who reportedly assisted Edison in early nickel-iron battery experiments.

The new battery is heralded by ABC as a major advance over the Edison cell presently in use. Leading advantages claimed are: longer life; lower internal resistance, making it suitable for high rates of discharge; fewer parts, 200 compared to 820 for the Edison unit; and nickel-plated steel current-carrying and structural parts, which are said to provide 25 times the structural strength of lead types.

In addition, the electrolyte, caustic potash, is a preservative of steel, designed to protect active materials of the electrodes from chemical deterioration by action of the electrolyte. Also, the design reportedly permits minimum spacing of plates since the electrolyte is not required in fixed or large amounts, as is the case with sulphuric acid.

ABC believes that the battery's compactness, long life, and its capacity to withstand shocks and rough handling make it ideal for aircraft, from both an installation and maintenance standpoint.

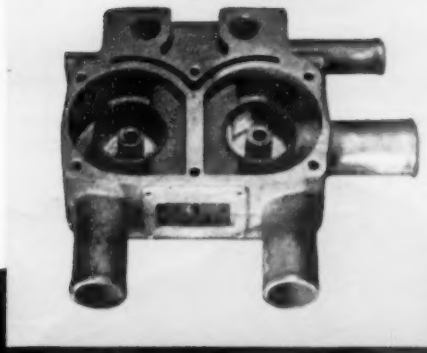
Another recent approach to the problem of improving aircraft storage battery performance is a sealed nickel-cadmium type produced by the French firm, SAFT (Aviation Week Apr. 27, p. 77).

New Techniques for Ceramics Processing

A new technique for stabilizing zirconium dioxide is expected to permit use of new fabrication methods that will reduce manufacturing costs and make the material available for greater utilization.

The stabilization process for the high-temperature ceramic material (4,000F) was developed by the Flight Research Laboratory of Wright Air Development Center. It involves the use of special additives to accomplish stabilization at lower temperatures than heretofore possible.

An important role for the ceramic is seen in future rocket and turbojet powerplant developments.



This heart must pulse or the Plane's in trouble–

Radiograph of de-icer pump casting

so it's checked by RADIOGRAPHY

ICE can down a plane as sure as flak. So it's kept from wing-edge and prop by the throbs of this pulsating heart.

Easy to see the importance of this tiny unit—and why its castings must be sound. To make certain, each part is x-rayed. This way weakness cannot lurk in a hidden flaw.

What's more—a part so finely finished calls for careful machining, which would be wasted if x-rays did not first reject any unsatisfactory castings.

It's another example of why more and more suppliers of castings use radiography. It speeds the establishment of proper casting technics and lets you be sure only sound castings are delivered.

If you'd like to know how radiography can improve your operations, get in touch with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

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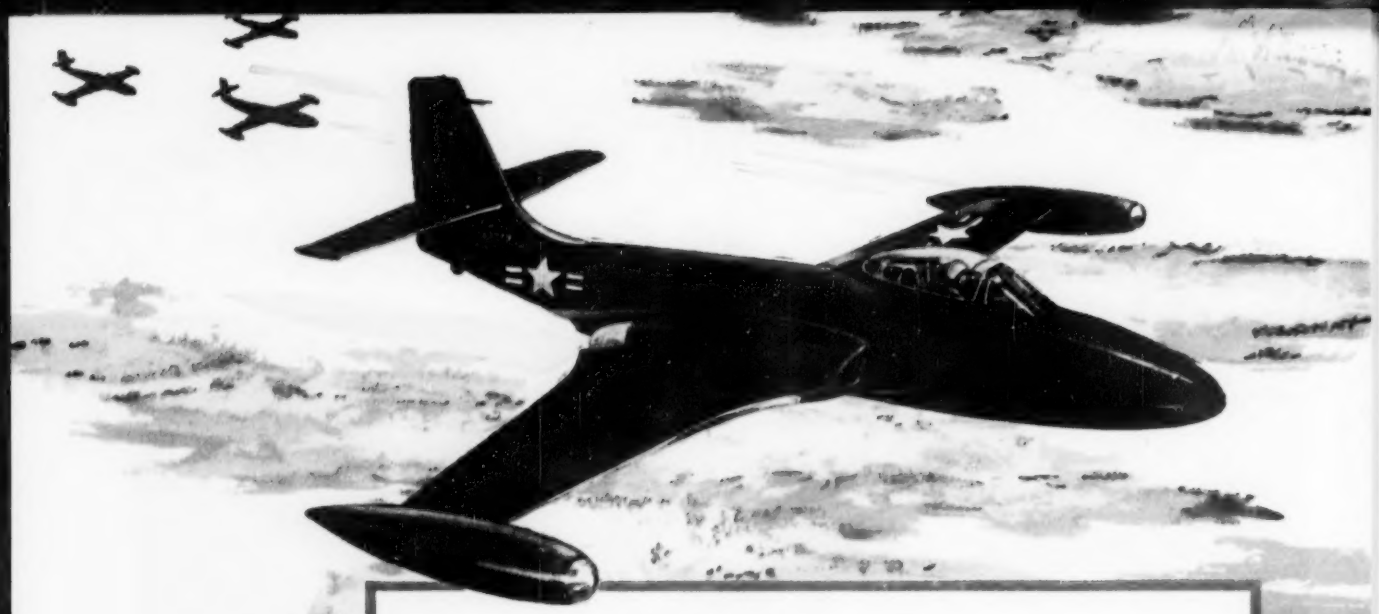


Muscular Power

that controls the McDonnell "Banshee"

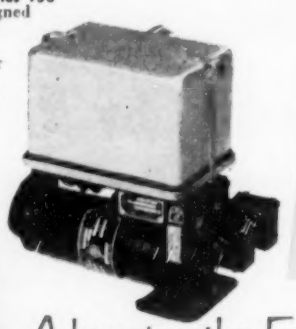
Even before she leaves the deck of a Navy Carrier, her pilot has this swift jet under finger-tip control . . . elevator trim tabs **and wing pins** moved and positioned by Lear electro-mechanical actuators.

Through Lear drive systems incorporating Screw Jacks, "T" Drives and Flexible Shafting, the Lear Power Unit illustrated transmits the required power.

Engineered to meet the specialized requirements of the "Banshee" . . . and other well-known aircraft . . . Lear Control and Actuating Systems provide space-saving power. On the "Banshee" such power is at the pilot's instant command through touch of a button or via automatic controls.

In aircraft large and small, military and commercial, Lear Controls, Actuating Systems and Components are making flight smoother, faster, more economical . . . and safer.

LEAR POWER UNIT Series 156
Typical of units designed for the McDonnell F2H-2. Specially developed as a power source, produced to meet specific aircraft requirements.



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ELECTRO-MAGNETIC CLUTCHES

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OTHER ELECTRO-MECHANICAL EQUIPMENT:
Electronic Temperature and Positioning Controls • Servo Actuators • Sub-miniature Motors • Dry Powder Clutches • Motor-driven Precision Gear Mechanisms

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LEAR-ROMEC DIVISION, ELYRIA, OHIO
LEARCAL DIVISION, LOS ANGELES, CALIFORNIA
LEAR, INCORPORATED, GRAND RAPIDS 2, MICHIGAN

USAF Contracts

Following is a list of recent USAF contracts announced by the Air Materiel Command.

Barco Mfg. Co., 500-530 N. Hough St., Barrington, Ill., ball assy., 1,064 ea., tube assy., 12 ea., 137 ea., $29,123.

Beech Aircraft Corp., 9709 E. Central Ave., Wichita, spare parts, $33,662.

Bell & Howell Co., 7100 McCormick Rd., Chicago, camera, literature, tabular list of parts, 202 ea., 1 lot, $167,708.

Charles Beseler Co., 60 Badger Ave., Newark, N. J., projectors, 383 ea., $136,237.

J. B. Carroll Co., 319 N. Albany Ave., Chicago, computer, dead deckoning, 20,000 ea., $88,200.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator, 4,132 ea., 6,428 ea., 6,058 ea., $5,797,948.

Electrol, Inc., 85 Grand St., Kingston, N. Y., valve assy., 424 ea., 82 ea., 10 ea., $49,358.

Elwood Pattern Works, Inc., 125 N. East St., Indianapolis, printer, 329 ea., $77,053.

Fabric Fabricators, Inc., 1534 Campbell St., Kansas City, Mo., cushion, aircraft, 10,215 ea., 5,702 ea., $68,828.

Fairchild Camera & Instrument Corp., Robbins Lane, Syosset, L. I., N. Y., camera body, 76 ea., $243,336.

Federal Aircraft Works, 3456 North Mississippi Drive, Minneapolis, ski assy., 6 sets, 6 sets, $45,060.

G. Felsenthal & Sons, 4114 West Grand Ave., Chicago, computer, dead reckoning, 30,054 ea., $128,931.

Gilfillan Bros., Inc., 1815 Venice Blvd., Los Angeles, radar signal simulator, spare parts, handbooks, 32 ea., $526,646.

B. F. Goodrich Co., 500 S. Main St., Akron, brake assy., 356 ea., wheel assy., 272 ea., 272 ea., $779,167.

Goodyear Tire & Rubber Co., Inc., 1144 East Market St., Akron, wheel assy., 434 ea., brake assy., 434 ea., 282 ea., $1,026,422.

Greenleaf Mfg. Co., 7814 Maplewood Industrial Ct., St. Louis, indicator, airspeed, 317 ea., $40,211.

Joy Mfg. Co., 338 South Bway, New Philadelphia, Ohio, blowers, 33 ea., 84 ea., $28,583.

Walter Kidde & Co., Inc., 675 Main St., Belleville, N. J., fitting assy., 7,916 ea., $46,435.

McCauley Industrial Corp., 1840 Howell Ave., Dayton, propeller, 500 ea., $83,000.

Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Minneapolis, components of E-6 autopilot, $1,203,548.

Pas-Ko Products, Inc., 12 Duane St., New York, gun camera, 350 ea., 258 ea., $41,777.

Philharmonic Radio & Television Corp., 235 Jersey Ave., New Brunswick, N. J., radio receiver-transmitter, $2,170,713.

Raytheon Television & Radio Corp., 5921 W. Dickens Ave., Chicago, electron tubes, $358,920.

Revere Corp., of America, Wallingford, Conn., transmitter, fuel flow, 1,778 ea., 9 ea., $401,235.

Salyers Equipment Co., 726 E. Washington Blvd., Los Angeles, generator sets, 6 ea., $52,416.

Scott Aviation Corp., Lancaster, N. Y., oxygen regulator, 3,503 ea., valve assy., 775 ea., gauge, 1,550 ea., $329,741.

O. A. Sutton Corp., 1812 W. Second St., P. O. Box 1894, Wichita, tank assy. (L.H.), 5,600 ea., tank assy. (R.H.), 5,600 ea., $3,201,270.

United States Rubber Co., Fuel Cell Div., Mishawaka, Ind., fuel cells, 101 ea., 336 ea., 721 ea., $191,204.

Weston Electrical Inst. Corp., 614 Frelinghuysen Ave., Newark, N. J., indicator, 5,679 ea., $494,981.

White Industries, Inc., 421 W. 54th St., New York, N. Y., pre-amplifier strip, 90 ea., 90 ea., antenna, whip, 90 ea., $34,972.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11.

Adel Div., General Metals Corp., Burbank, Calif., valves, $43,118.

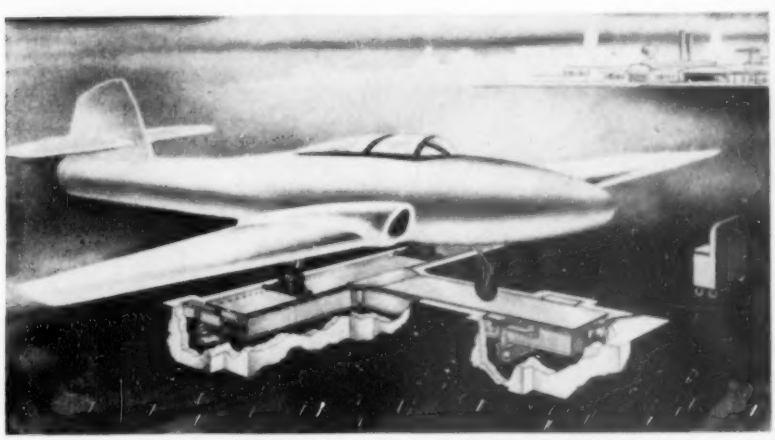
Aeroflex Laboratories, Inc., 34-06 Skillman Ave., L. I. 1, Capacitor, 77 ea., $25,729.

Ahrendt Instrument Co., Inc., 4910 Calvert Rd., College Park, Md., flight track recorder equip. and handbooks, $355,750.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 5, N. J., maintenance parts for actuator, $70,633.

Aluminum Co. of America, 1200 Ring Building, Washington 6, D. C., aluminum alloys sheets, $34,210, aluminum alloy for maintenance aircraft, $63,849.

Auburn Spark Plug Co., Inc., 89 York, Auburn, N. Y., contact used on harnesses of various aircraft engines, 900,000 ea., $39,240.



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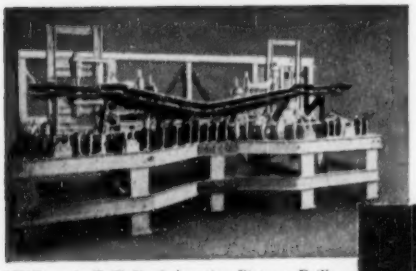
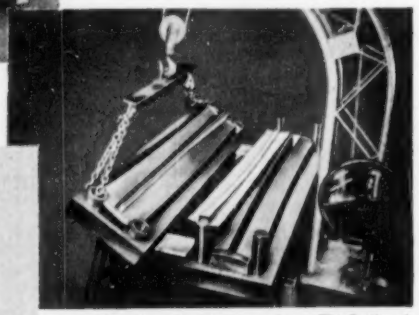
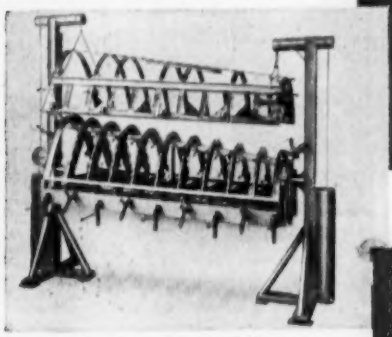


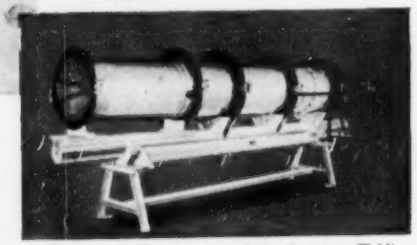
TWIX made Drill Jig & Locating Fixture: Drills the rivet holes and Locates and Holds all parts that make-up the Main Beam of the Aircraft. (Jig: 20' long x 4' wide x 10' high)



TWIX made Die to make a Hat-Sectioned Longeron in one operation. Longeron Dimensions: 72" long x 7" wide having Double Contour.



TWIX made tool for Routing, Drilling and Assembly of a Turtle Deck. (6' long, 4' high, 8' wide)



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Chelsea Clock Co., 284 Everett Ave., Chelsea, Mass., mechanical wall clocks, 2,005 ea., $111,719.

Cleveland Pneumatic Tool Co., 3781 E. 77 St., Cleveland 5, drag truss assy., 28 ea., $186,702.

Durham Aircraft Service, Inc., 56-15 Northern Blvd., Woodside 77, N. Y., overhaul of sights for various aircraft, $180,907.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., pressure indicator, 531 ea., $39,946; pump parts for P & W engines, $441,792.

Erno Machine Co., Inc., 61 South Lexington Ave., White Plains, N. Y., parts for aviation armament, $796,552.

Foster Chemical Co., 114-14th Ave., Oakland, Calif., thinner, $42,085.

Garod Radio Corp., 70 Washington St., Brooklyn 1, radio test set, 7 ea., $25,254.

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Grimes Mfg. Co., 515 N. Russell St., Urbana, Ohio, keyer, lens, light, etc., $35,269.

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Lockheed Aircraft Co., P.O. Box 551, Burbank, Calif., maintenance parts for aircraft, $36,668. Maintenance parts for PV-2 aircraft, $91,499.

Lowe Bros. Co., 424 E. Third St., Dayton 2, lacquer, $49,836.

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MacDonald-Bernier Co., 82 Commercial Wharf, Boston 10, emergency drinking water, 177,026 ctns., $360,739.

Meckum Engineering, Inc., Dayton Rd., Ottawa, Ill., mooring mast for various airships, 4 ea., $48,860.

Model Engineering & Mfg., Inc., 50 Fredericks St., Huntington, Ind., signal generator, 413 ea., $424,998.

Nasco, Inc., 5005 Euclid Ave., Cleveland 3, motor, 1146 ea., $49,851.

New York Air Brake Co., 230 Park Ave., New York 17, hydraulic pump assy., $1,046,927.

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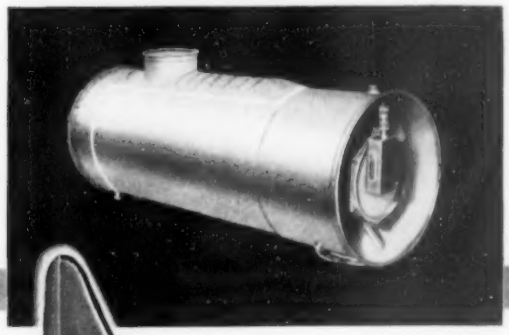

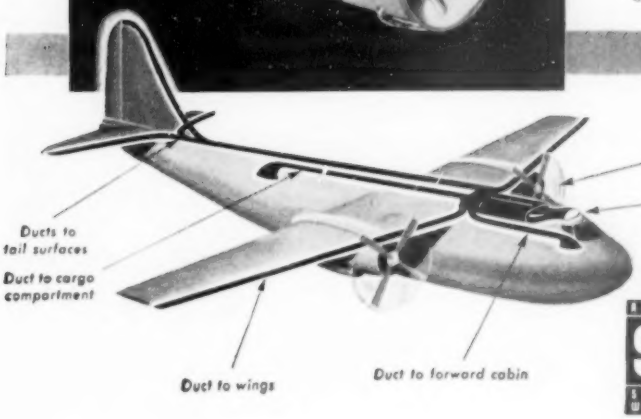
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Experimental Shops Pretest Production

SAE forum analyzes engineering and manufacturing factors of trial output, vital step in creation of aircraft and engines.

Experimental manufacturing, first step in production of engines and airframes, has become increasingly difficult because of exacting design and performance requirements of modern aircraft.

This creative activity is a vital segment of the manufacturing scheme because it translates engineering drawing into practical working products before the production department fully comes into the picture. It acts as an economy department, provides proving article before the production group tools up for a new job.

Experimental manufacturing was analyzed broadly in relation to general engineering and production considerations at the Society of Automotive Engineers' recent Production Forum, in New York.

A panel*-and-audience group of industry engineers brought out details of vendor considerations, tooling aspects, relation of design to manufacturing, quality control problems and manufacturing group divisions.

A report of the discussion follows.

Make or Buy?

• WHAT is considered an experimental quantity?

One to 100 parts or assemblies are considered experimental quantities, depending upon the type of part or the purpose for which it is to be used.

• DO engineering and experimental manufacturing personnel conduct continuing discussion on vendors?

Most experimental procurement departments hold daily or periodic meetings with design engineers and representatives of experimental manufacturing and purchasing to determine make-or-buy considerations and the principal vendors to be selected.

At these meetings, decision is made on parts to be manufactured by the prime contractor and those selected for vendor procurement. Usually, the most critical parts are retained by the prime contractor unless there are vendors who have open time and necessary equipment to handle these specialized items. Each prime contractor has his own make-or-buy split depending upon the facilities at his disposal.

• DO prime contractors estimate time required to produce parts?

Generally both time and cost of all parts, especially those which are considered for purchase, are estimated. These figures are very necessary for comparison of vendor bids.

• IS the experimental purchasing group a part of the production purchasing department or is it an independent organization?

It is considered best to separate experimental purchasing for the purpose of supplying engineering program needs. These departments should operate under their own rules targeted specially at experimental purchasing requirements.

• HOW is delivery of purchased items determined?

The promise date for any part should be related to the delivery of the part requiring the longest time to complete a given program. This allows the vendor the maximum manufacturing time. This objective date must be revised as a more realistic delivery date becomes available during the progress of the project.

• WHAT ratings are considered on purchased parts?

Generally, vendors are selected on the basis of quality, delivery and price.

Vendor Development

• WHO is responsible for securing vendors?

This usually is the responsibility of the experimental purchasing department, but reviews of vendor capabilities usually are made by experimental manufacturing department in conjunction with purchasing personnel.

It is important that the vendor be well informed on the quality and delivery requirements for the parts before the order is placed. Lack of this knowledge often results in an underestimation of order requirements, and quality may be sacrificed by the vendor to avoid a financial loss.

Because most experimental purchases are made on the basis of fixed price or various time and material agreements, it is necessary that new vendors be investigated to determine adequacy of facilities, quality control methods, works procedures, work load and experience in the particular field in question.

• IS financial assistance to subcontractors common?

In the experimental manufacturing field, it is unusual to give financial assistance to a subcontractor, because this type of help usually can be sanctioned only when the parts are tied into a production contract. This is rarely the case in experimental work.

On occasion, however, machine tools are loaned, processing information given, and all types of engineering data are made available to the subcontractor without charge.

• TO WHAT extent should a prime contractor assist a subcontractor?

All information pertaining to the job should be furnished the vendor upon request, and constant procurement and engineering liaison should be maintained to assure deliveries with maximum quality.

Usually, vendors should determine their own process engineering to suit their particular machine tools and facilities, and should be assisted by the prime contractor only upon request.

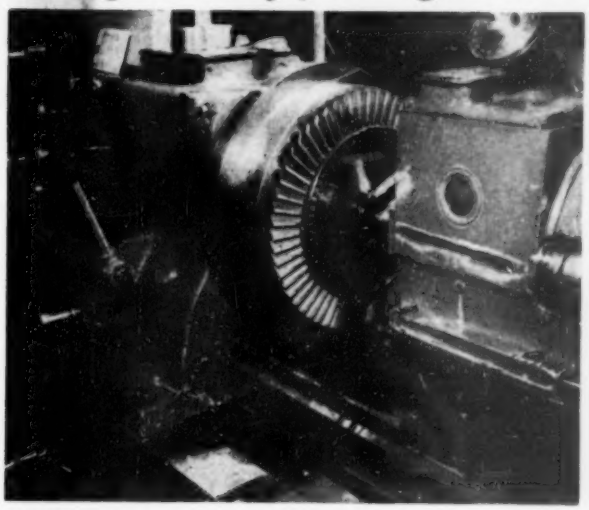
• SHOULD experimental vendors do production work to meet expenses when they are not equipped to do this work economically?

Regardless of the type of contract employed, experimental vendors are expected to make a profit. The problem is accentuated by fluctuations in volume, and these vendors should develop several customers in allied lines to minimize the effect of experimental work fluctuations.

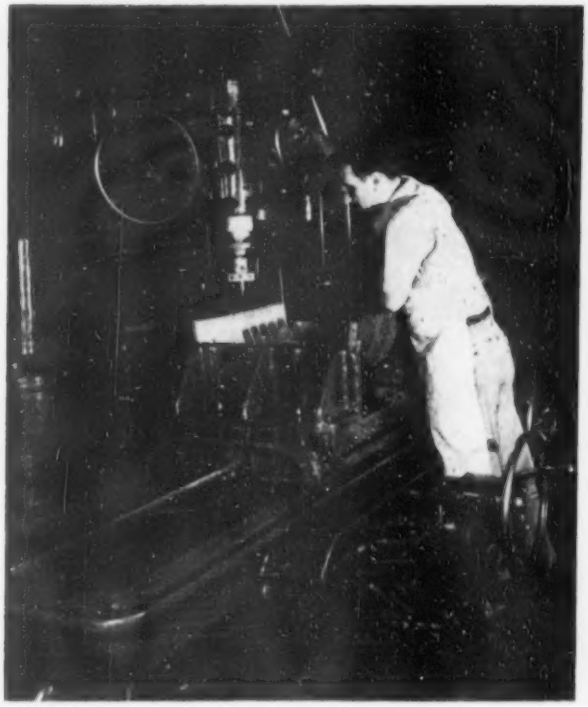
Where possible, an experimental vendor should accept the responsibility to develop production capacity as a further help to smooth out volume fluctuations. Conversely, production vendors should accept experimental orders

*Allan Chilton, Curtiss-Wright Corp.'s Wright Aeronautical Division's experimental operations development director; G. E. Nelson (panel secretary), president, G. E. Nelson Co.; J. W. Chalupa, Westinghouse Electric Corp.'s Aircraft Gas Turbine Division's asst. manager of manufacturing; Karl Scheucher, Thompson Products, Inc.'s Jet Division's factory engineer; Joseph Ballard, United Aircraft Corp.'s Pratt & Whitney Aircraft Division's chief of experimental operations; P. W. Schipper, Douglas Tool Co.'s general manager; E. N. Laurence, Glenn L. Martin Co.'s divisional superintendent.

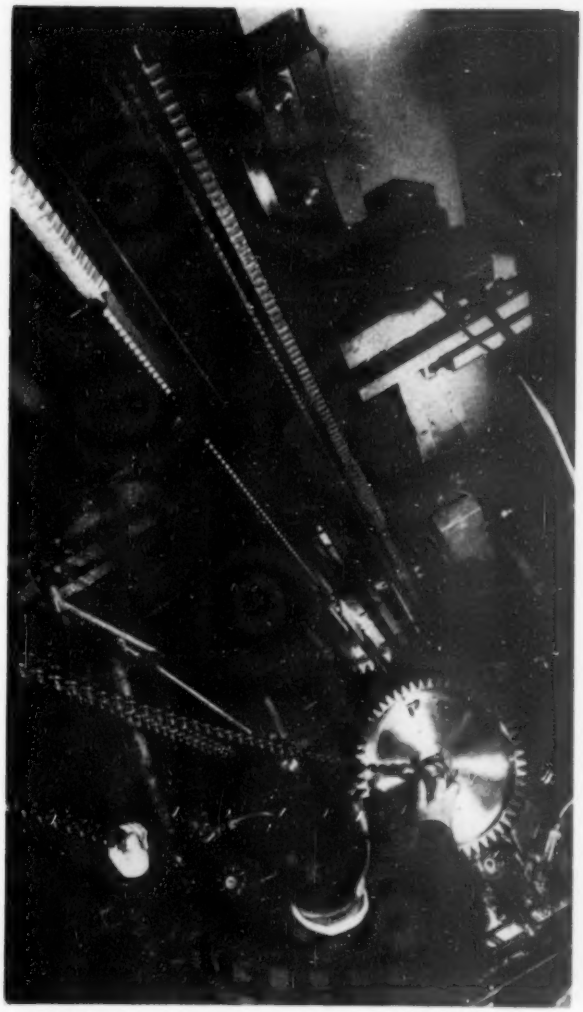
Paving the Way for Engine and Aircraft Production . . .



KINKS are ironed out in machining turbine wheel.



JIG BORE operator works on compressor housing.



BROACHES are fast way to cut slots in turbine disk.

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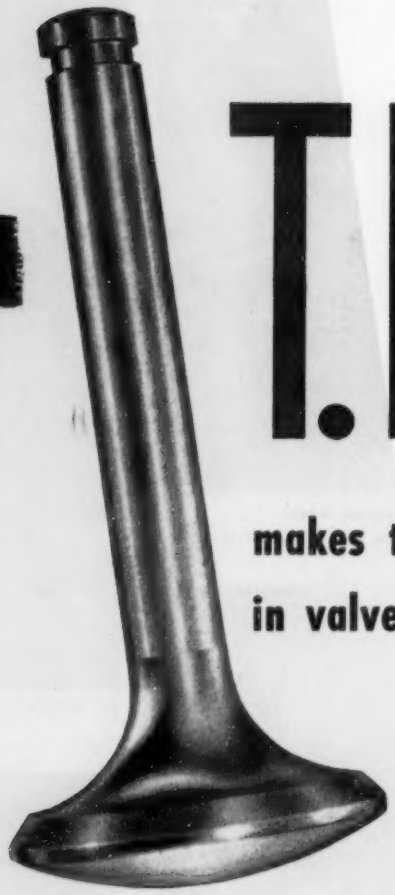

T.P.M. VALVE

These two Thompson valves from Pratt and Whitney Aircraft R-4360 Engines were photographed after first overhaul.

T.P.M. is the new valve material developed by Thompson to give greater corrosion resistance and higher strength at valve operating temperatures. T.P.M. is a result of Thompson's vast experience in valve development and knowledge of the behavior of metals at high temperatures.

Other Thompson "firsts" include a new coating alloy for valve heads and faces, and stem-peening to provide harder, more wear-resistant stem surfaces.

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to maintain familiarity with new materials and processes, which may be required for future, potential production-parts. Some production vendors are reluctant to accept experimental work. This is considered a shortsighted policy.

It is the responsibility of the prime contractor to maintain, where possible, sufficient volume of work with experimental vendors to keep their operations on a financially sound level. It is also his responsibility to educate and sell production vendors on the benefit of doing experimental work.

• CAN the prime contractor select the experimental vendors to be used, under a fixed-price government contract?

Usually, prime contractors are responsible for the selection of experimental vendors, but placing of the orders with these concerns is subject to government approval, requiring three bids in many cases. The rules governing these procedures vary, depending upon the procuring agency's interpretation.

• ARE vendor quality control facilities investigated before orders are placed?

Usually, representatives of the prime contractor investigate facilities and quality control methods used by potential vendors when special or critical processing is involved, and especially where the product is an assembly upon which inspection of all details prior to assembly is required.

• DO prime contractors furnish inspection gages and fixtures to vendors?

In experimental procurement, vendors are not furnished with inspection tools and gages, except in unusual cases.

Tooling Factors

• WHAT percentage of experimental parts are used in production?

For an approximation, one out of every three experimental part numbers may eventually be used in production. Hence, it is advisable to use temporary tooling. Also, temporary tooling is desirable because engineering changes on experimental parts may obsolete a portion or all the original tooling.

In most cases, the experience and ability of those working on experimental items is more important than the degree of tooling.

• ARE experimental parts procured by modifying production parts?

In some cases, experimental parts can be obtained by modifying or reworking production parts, or they may be ordered from a production source.

• DO experimental delivery dates normally limit the vendor's available tooling time?

In many cases, experimental delivery dates are so short that compromises in required tooling are made to meet the deadlines. Here again, reliance upon experience and ability of personnel involved comes into play.

• Should inspection tools and fixtures required for experimental work be kept to a minimum?

In the interest of cost it is usual to keep all tools and fixtures to a minimum. But, to assure the proper machining of companion experimental parts, prime contractors may furnish the vendor with the necessary tools—drills, jigs, etc.,—or have the vendor manufacture similar tools for itself and the prime contractor, where similar parts are made in two sources.

More elaborate tooling than the minimum required would not necessarily improve the percentage of experimental parts accepted and might greatly lengthen the delivery date of the parts.

There are many cheap types of tooling, such as concrete forms used by airframe manufacturers for stretch-forming operations, Kirksite tools which can be recast after use to salvage the tool material and the Kirkside. Similar material also has been successfully used by manufacturers for roll-forming operations.

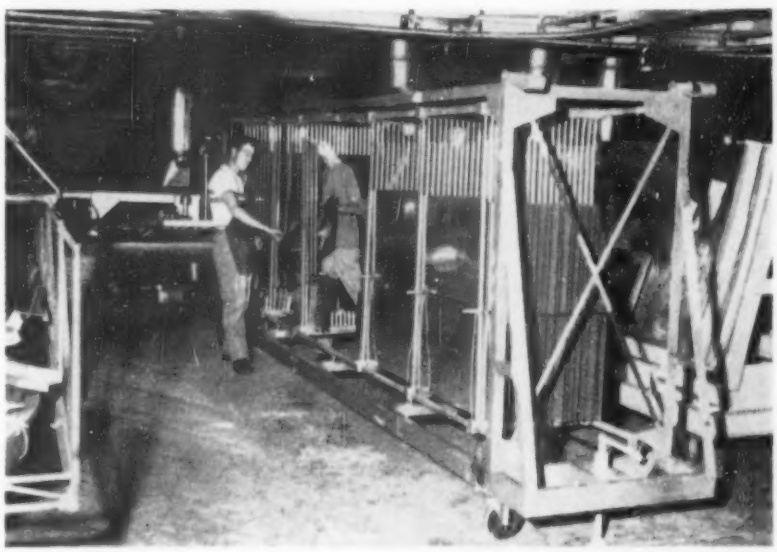
• ARE material substitutions and dimensional deviations permitted?

When circumstances permit, material substitutions and dimensional deviations are accepted on experimental parts in order to obtain delivery. In all cases, however, when these decisions are made, it is with the full knowledge of the engineers involved and are usually restricted to one or two parts on the order.

Liaison

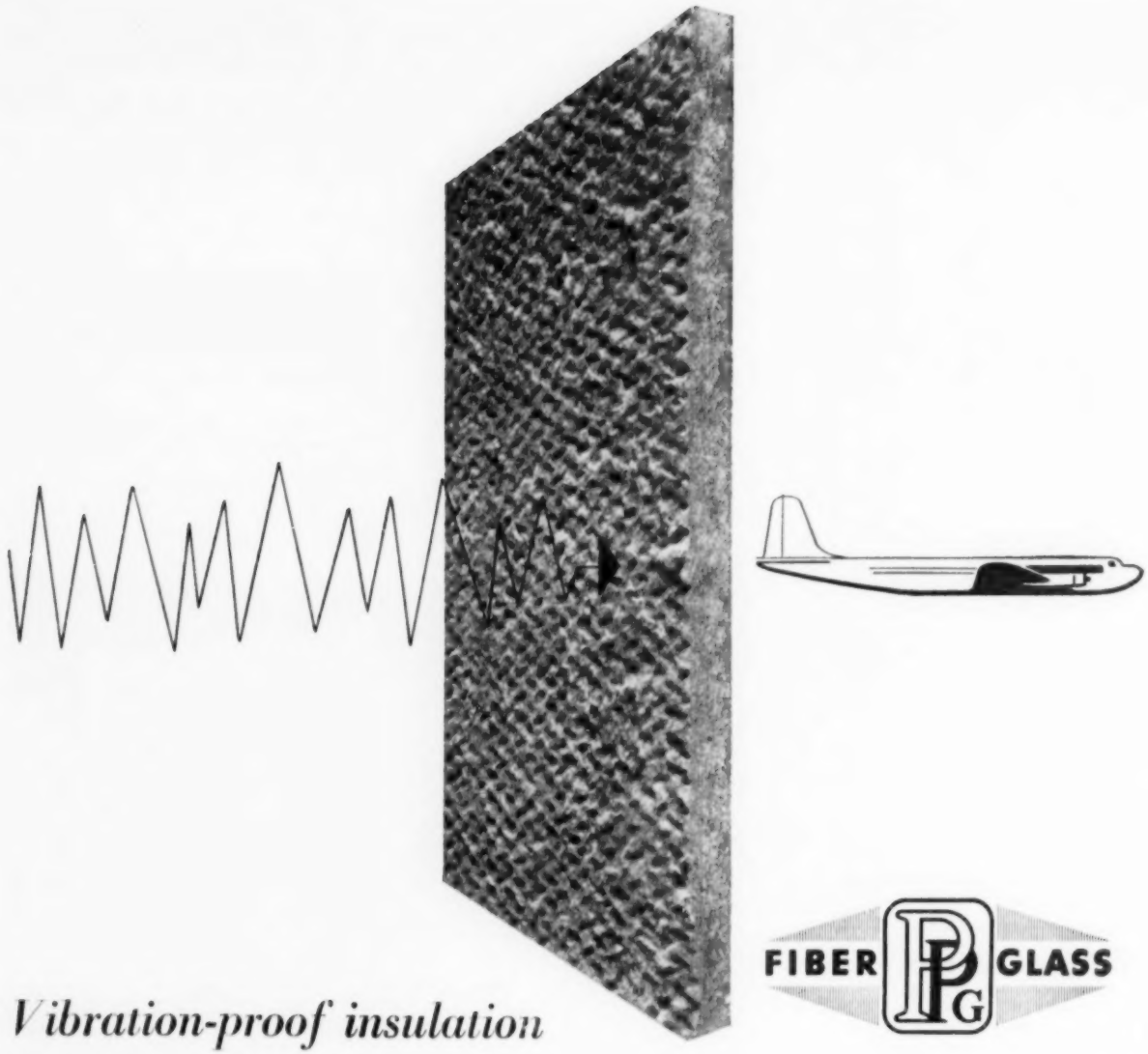
• SHOULD engineers consult with manufacturing groups prior to finishing designs?

Prior to the release of an experimental design, it is most desirable to have constant contact between the design



CONVAIR MONEY-SAVERS

The employe-suggestion system has saved Consolidated Vultee Aircraft Corp.'s San Diego Division about $1.5 million in manufacturing costs in a seven-month period. Employes submitted 4,061 ideas in this period—more than 45% over the number turned in for the corresponding months last year. One of the suggestions, which eliminated hand-cleaning operations, resulted in the sheet-holding rack (above), an idea saving $6,500 annually. The rack holds 100 aluminum skins for cleaning operations. Each sheet is separated by vertical dowels to prevent scratching and water marks. An overhead crane moves the rack and lowers it into the cleaning tank. The result of another suggestion is the "ferris wheel" fixture (right), which eliminates horizontal assembly of belt frames. This scheme is saving Convair about $2,000 annually. Biggest saving—$155,780—stemmed from a suggestion which instituted a new program for ordering and stocking extrusions. Convair's San Diego "savings" goal this year is targeted at $5 million.



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engineers and the manufacturing group. This liaison should be extended by inviting vendors, if they are known at the time the design is being processed. In this way practical design tolerances can be obtained.

Sometimes the designs are evaluated by the production manufacturing group before release for experimental manufacture. Alternately, designs are reviewed by production departments after experimental manufacture, but prior to release for prototype quantities.

• HOW does engineering fit into quality control?

Project engineers, with the assistance of the inspection department, establish the quality control functions on experimental work. The manufacturing group or the vendors must request approval of any changes through the project engineering group before proceeding with the job. All these changes should be reviewed by engineering and experimental manufacturing personnel before release. If this procedure is followed, tolerances closer than required can be altered, with resultant economies in manufacture.

• WHAT happens when experimental design gives a part that is not adaptable to production processing?

If correct evaluation has taken place between the design and manufacturing groups, there should be no parts which cannot be adapted to a production process. Very serious delays and great expense will result if the designs eventually cannot be adapted to production methods.

• WHAT is the normal liaison between purchasing and engineering groups and vendors?

The normal method is for the purchasing department to make and maintain all contracts with the vendors, calling in the engineers on all processing problems. Frequent trips by vendor personnel to the prime contractor's facility also help in clearing up misunderstandings and in initiating worthwhile changes in procedure.

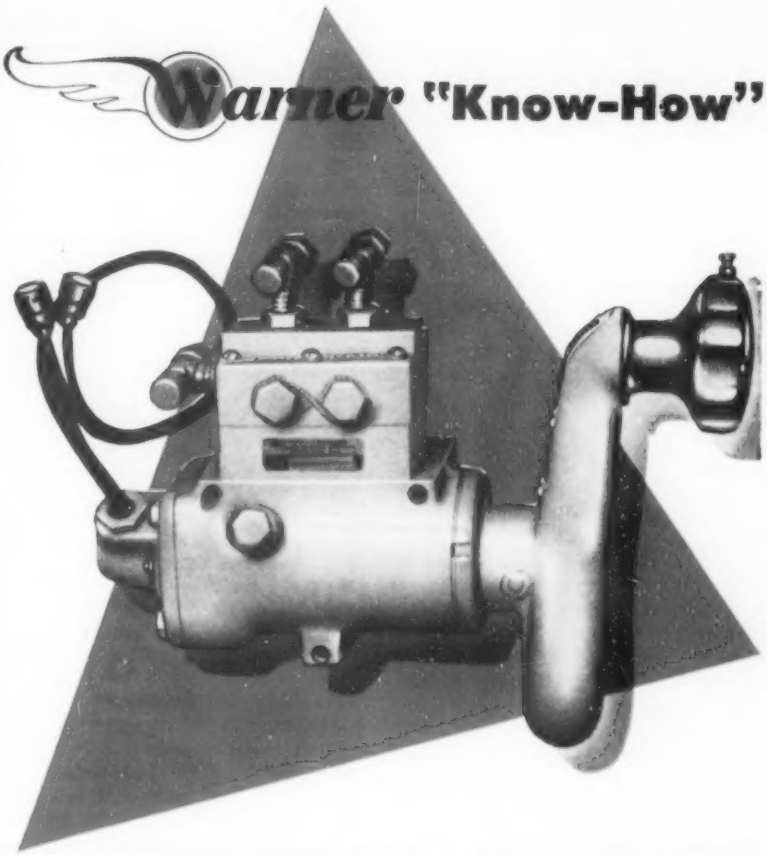
It is essential that the experimental manufacturing group inform the engineering department of variations and deviations on experimental units, so that accurate records and drawings can be kept. Some manufacturers require production personnel to participate in the manufacture of experimental and prototype parts to minimize the problems of transition from the experimental to the production phase.

Special Control

• WHAT are the basic difficulties in adapting foreign designs to American practices?

After the first evaluation of a foreign design and discussions with originating

Warner "Know-How"



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engineers, the transition to American practices can be made fairly smoothly. It is believed that both foreign aircraft and engines have revealed the use of far greater tolerances than are considered permissible by American production standards.

It is felt also that foreign designs have been made quite independently of the manufacturing problems and processes involved—the manufacturing groups are not accorded the same degree of participation common in this country. Also, foreign machine tool equipment restricts the use of our higher production techniques, and production quantities involved are much smaller than that accustomed to be handled here. However, foreign production models appear to be kept more up-to-date with respect to changes than are American designs.

It is believed the apprenticeship training programs in use in Europe are superior to those here and are used extensively to develop the manufacturing skills by most concerns in the aircraft business.

• HOW are optimum tolerances for both design and processing requirements obtained?

Workable tolerances are usually decided by engineering and manufacturing personnel. The development testing of the experimental model finally establishes the maximum tolerances permissible without detrimental effect to the product.

• DOES production activity tend to restrict engineering to designs and tolerances required for easy manufacture?

A reasonable compromise is required between the design and manufacturing process requirements and consideration must be given the economic aspects of each problem. Production tolerances sometimes can be increased as a result of successful experimental tests on parts which have had dimensional deviations accepted for this purpose. This is a continuing situation in the development of any product and the closer the contact between engineering and manufacturing groups, the better and cheaper the resulting product.

Shop Divisions

• ARE most facilities divided into experimental, semi-production and production departments?

Two systems are advocated for the transition of projects from the experimental stage to the final production version.

The three-stage system requires an experimental department, prototype shop and a production facility. Here, the experimental department is responsible for all manufacturing and testing required for acceptance of a given design, which then is turned over to a prototype shop capable of producing up to a maximum of 10 units per month, while the production activity uses the experience of both experimental and prototype departments in arranging the tooling for quantity manufacture.

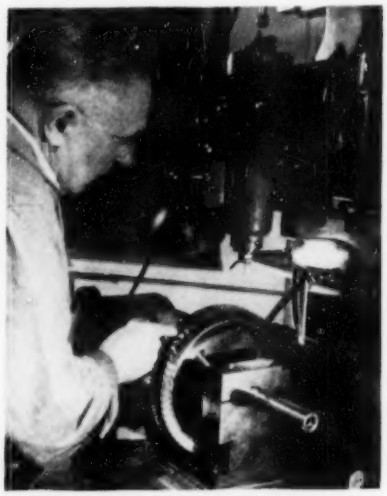
In the two-stage system, the experimental department is required to manufacture the initial units and the production department immediately takes over fabrication of prototype and production quantity.

• ARE complete units built in the prototype department?

It is usual to build complete units in prototype production for limited quantities of new designs, using the experience gained to assist the production department in obtaining the equipment to produce the new design in quantity.

The prototype production department may also be used for reworks and modifying production designs, assisting in general to accelerate the incorporation of needed changes. This prototype facility usually takes advantage of some of the experimental sources used in manufacturing the initial parts of a new design.

Preproduction departments eliminate production manufacturing problems, whereas the two-stage system requires the production department to handle all prototype requirements over and above the initial experimental quantity.



ONE PIECE, TWO WHEELS

Experimental two-stage turbine and shaft, an integral configuration machined by Accurate Products Co., Hillside, N. J., for Reaction Motors, Inc., Rockaway, N. J., embodies 66 high-pressure buckets and 128 second-stage buckets. Machined from a single rough forging of International Nickel Co. Inc.'s Inconel X, the unit's buckets are held to tolerances of .002.003 in., while shaft is machined to .0004-in. tolerance. Work was done on a modified Gorton engraving machine.

Whichever way the problem is solved, it is essential that a considerable amount of time be spent by the personnel of the department involved to compile the special detailed information for the manufacture of the parts required. The real merits of the two systems can hardly be compared without knowing the general system of operation of the company concerned.

• SHOULD the experimental department be a part of the production department or a separate unit?

The unanimous opinion is that experimental work should be separated from the production department, even in relatively small plants, because any combination invariably would be to the detriment of the experimental work involved.

• WHAT is the best source of experimental engineering and manufacturing personnel?

Personnel should be upgraded from various production functions to the experimental department to obtain the benefit of their manufacturing experience.

Because greater skills are required by experimental manufacturing personnel, it is usual to make these positions more attractive by increasing the hourly rates for equivalent occupations in comparison with the production wage scale, and applying a shift differential when two or three shifts are worked.

Schedules

• WHAT are the scheduling requirements for experimental manufacturing procedure?

A general outline of an experimental scheduling procedure includes these steps: All parts are estimated for time and cost; parts are scheduled; a tracer card accompanies parts during manufacture; schedule and progress of parts are checked periodically.

Tracer cards are marked, showing a relation of status of parts to schedule by indicating a "plus" amount of time for parts ahead of schedule and a "minus" amount of time for parts behind schedule. Parts marked minus are given priority for available manufacturing time. The scheduled manufacturing day indicates date manufacture of part is to start. The scheduled manufacturing week indicates completion date of the part. An IBM system of scheduling parts to minimize the work required in changing schedules frequently is used.

• WHAT is the ratio of design time to manufacturing time?

Time required to manufacture parts is equal to or as high as 150% of design time, depending upon the complexity of the part. The time to "manufacture" is divided into 25% for processing, 50% for tooling, and 25% for manufacturing.

Westinghouse Upping NACA Tunnel Power

National Advisory Committee for Aeronautics is converting a 19-ft. subsonic windtunnel at its Langley Laboratory into a transonic facility. Westinghouse Electric Corp., Pittsburgh, Pa., will replace the existing 8,000-hp. motor and fan with a new 20,000-hp. drive and fan. The motor will be installed in the tunnel and enclosed by the fan nacelle.

In addition to the new motor, Westinghouse is supplying a 25,000-kva. transformer having 22- and 110-kv. taps, a liquid rheostat for secondary control of the motor, and other auxiliary equipment.

The motor's full 20,000 hp. will be required at two different top speeds, because Freon and air will be used interchangeably in the tunnel.

Bathing Cleans Dies Faster Than Grinding

Dimple-die cleaning that took eight hours a week is now done in 10 minutes at Temco Aircraft Corp., Dallas. The parts are now bathed instead of ground.

Grinding did the job satisfactorily, but the procedure required an average of a manhour per day. Frequently, abrasives caused more damage to the die than did the foreign matter which was to be removed. Also, abrasive stones did not fit the small contours of the die faces, resulting in die disfiguration. About one-fifth of the dimple dies had to be discarded.

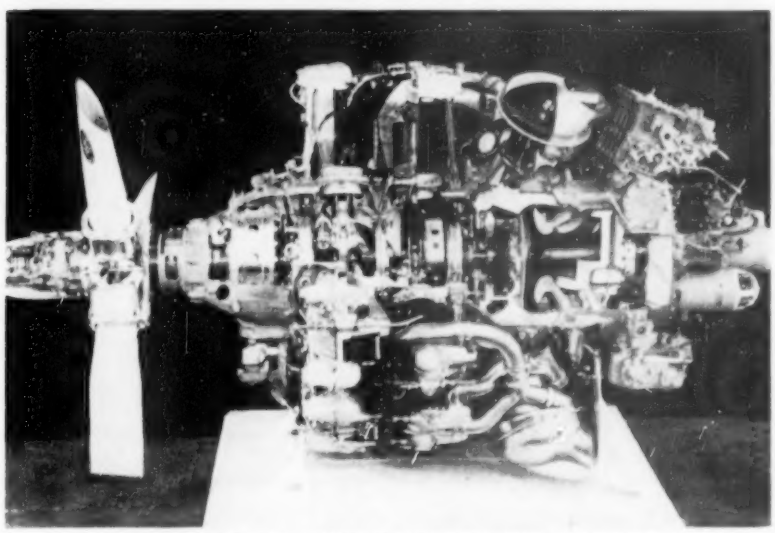
►**No Damage**—Temco's D. R. Gates came up with the bath-cleaning procedure, which will not damage chrome, steel or iron die materials. A caustic soda and water solution (one cup to a gallon) is heated to 200F in a glass or steel container on a hot plate. The dirty dies are lowered by steel or iron baskets into the solution for two to 10 minutes, water-rinsed and rag-dried.

Convertawings to Test Extruded Rotors

Convertawings, Inc., Amityville, L. I., N. Y., has received a number of solid extruded aluminum rotor blades from Jacobs Aircraft & Engine Co., Pottstown, Pa., for installation on a four-rotor helicopter prototype.

Convertawings is developing several convertiplane designs privately, including a version to be powered by turboprop powerplants. The firm is now building a small prototype of the four-rotor configuration powered by two 90-hp. engines. Prior to the first flight it will put new Jacob-built blades through extensive whirl-stand tests which will prove the feasibility of rotating them at considerably higher revolutions than used with current copters. High disk loadings will also be tried during these initial ground tests.

The blades furnished by Jacobs are 7 ft. 6 in. long from hub to tip and 3.75-in. chord. Similar blades of larger chord are being developed by Jacobs for the Air Force.



DETAILS OF TURBO COMPOUND BARED

This sectioned exhibition Wright Turbo Compound engine details the 3,250-hp. powerplant's inner workings, including one of the exhaust gas turbines (top, right). Three of these small turbines are on each engine to convert waste energy into additional power which is transmitted to the main shaft. Note the cutaway Curtiss propeller whose blades are made by the extrusion process.

WHAT'S NEW

New Publications

Letter Symbols for Meteorology is a new American standard to eliminate confusion in the use of these symbols in weather reporting. The new symbols have been approved by the American Standards Assn. The report, designated Y10.-1953, may be obtained from the association at 70 E. 45th St., New York, or the American Society of Mechanical Engineers, 39 W. 39th St., New York.

Tables for Rocket and Comet Orbits, by Samuel Herrick, is planned to permit accurate calculation of the position and velocity of rocket-powered vehicles traveling directly away from or toward the center of the earth. An introduction contains sections on rectilinear motion, origin of the functions, direct interpolation, nearly rectilinear or "nearly parabolic" motion, position and velocity from time, time from position and velocity, method of computation of the tables and a listing of reference literature.

Telling the Market

Welding and metallurgical aspects of stainless steels—covering martensitic, ferritic and austenitic types—are discussed in Bulletin GET-1955, distributed by General Electric Co., Schenectady 5, N. Y.

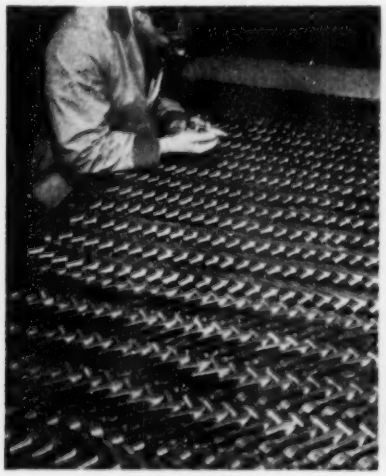
Lathe operator training is covered in three 16-mm. color sound films: The Metalworking Lathe, Plain Turning and Grinding Cutter Bits. They are available on loans from South Bend Lathe Works, 425 E. Madison Ave., South Bend 22, Ind. Running time is approximately 20 min.; sound tracks are available in English, French and Spanish.

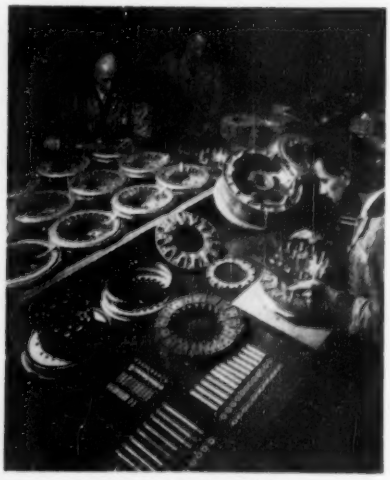
Arc weld surfacing—building up layers of metal or a metal surface by electrical arc welding—is detailed in Bulletin 466. Write Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17.

Making precision diecut stampings in small lots is described and several representative examples given in 24-page brochure distributed by Dayton Rogers Mfg. Co., Minneapolis 7, Minn.

Case history of Sciaky electric resistance welding equipment used on external aircraft fuel tanks for the Northrop F-89, including seam welding techniques, is detailed in bulletin Resistance Welding at Work, Vol. 3, No. 6, available from Sciaky Bros., Inc., 4915 W. 67th St., Chicago.

INSTRUMENT OVERHAUL is accomplished in air conditioned shop; at right, driftmeter is checked by technician.





OTHER SECTIONS of Aviation Electric's plant overhaul electrical equipment (left), engine parts (center) and brakes (right).

Canadian Overhaul Firm Expands

Aviation Electric turns to manufacturing; will make Bendix instruments and accessories under license.

By George L. Christian

Montreal—Aviation Electric, Ltd., is going into the business of manufacturing aircraft instruments and accessories, with an assist from Bendix Aviation Corp.

The first units AE will make are rate-of-climb indicators, magnetic compasses, accelerometers, fuel and oil pressure transmitters and indicators. Turn-and-bank instruments and other items will come later. All will be made under license from Bendix.

▶**Ultimate Goal**—Started 22 years ago as a sales and overhaul organization, Aviation Electric sees its present move into manufacturing as a big step toward its ultimate ambition. That ambition, A. Bandi, president and founder, told AVIATION WEEK, is establishment of his own engineering and development organization, so that eventually AE will be manufacturing products of its own design.

The new manufacturing program currently represents a very small part of Aviation Electric's $10-million annual business. Primary efforts go into sales and overhaul—sales account for 70% of the company's turnover, production 30%.

Aviation Electric is the official representative and exclusive agent for a number of British and U.S. firms, including Teddington Controls, Ltd.; Hymatic Engineering Co., Ltd.; Newton Bros. (Derby), Ltd.; Lodge Plugs, Ltd.; U.S. Gauge Div. of American Machine and Metals, Inc.; and these divisions of Bendix Aviation Corp.: Eclipse-Pioneer, Scintilla, Pacific, Red Bank, Bendix-Stromberg, Bendix Products, Bendix Radio.

▶**New Plant**—The overhaul section of Aviation Electric's new plant, erected in a recent commercial development on the outskirts of Montreal, is neatly laid out.

Parts flow smoothly from one operation to another, aisles are clear, and the whole shop gives the impression of organization and efficiency. Here the firm overhauls F-86 brakes and wheels, Lodge and Champion spark

plugs, aircraft alternators and generators, relays, anti-icer pumps, high- and low-tension magnetoes, carburetors, oxygen regulators, starters, inverters, radio transmitters and receivers, and hydraulic components.

All aircraft instruments, including timepieces, are overhauled in an air conditioned room which is slightly pressurized. The pressure differential keeps outside dust and dirt from entering the instrument shop when doors are opened.

Bandi says: "Aviation Electric's facilities are capable of inspecting and overhauling practically any instrument and accessory of U.S., British or Canadian manufacture."

▶**Price of Variety**—This versatility has its price, Bandi says. Handling small quantities of many different types of units makes it difficult to apply the methods of mass production, prevents the company from getting the full benefit, in terms of time and money, of assembly-line procedures.

In one year, the overhaul company handles about 1,000 different types of accessories and instruments, made by 80 manufacturers from various countries. Several thousand individual units pass through Aviation Electric's shop each month.

About 95% of the company's work is for the aviation industry.

▶**Made to Order**—Ancient components for which spares no longer exist give Aviation Electric some headaches. The company must custom-manufacture these parts as required. This problem is made more severe by the fact that Canadian bush pilots are still flying old crates that date back to the Twenties.

Bandi's biggest overhaul customer is the Royal Canadian Air Force; his largest purchasing customer is the Canadian government. Other accounts are a cross-section of the Canadian aviation industry.

They include: Trans-Canada Air Lines, Canadian Pacific Airlines, Canadian Pratt & Whitney, Ltd.; Maritime Central Airways, Ltd.; Ontario Provincial Air Services; Rimouski Airlines, Ltd.

▶**Started in 1931**—Bandi started his company in Montreal in 1931 with four employes and a 3,000-sq. ft. shop. He sold Scintilla aircraft and industrial equipment at first, later added other lines.

Now Aviation Electric has a new 93,000-sq. ft. building, of which 75,000 sq. ft. is productive, 10,000 sq. ft. is for offices, and the remainder for stores. Current employment exceeds 600.

Ample grounds around the plant provide the room for Aviation Electric to expand in pace with Canada's fast-growing aviation industry.

UAL Buys Bendix Glide Slope Receiver

United Air Lines has ordered 79 Bendix Radio's new glide slope receivers for installation in 25 DC-7 transports, scheduled for delivery to UAL next year.

Bendix says the receiver later will become standard equipment in United's entire fleet.

The communcations division of Bendix Aviation Corp., Baltimore, cites high sensitivity as the principal advantage of its recently marketed unit and describes the receiver's stability as "extremely good under a wide variety of conditions."

Labeled the MN-100A, the receiver provides 20 channels in a frequency range of 329.3 to 335 mc. VOR-localizer-glide slope control—also used with Bendix NA-5 distance measuring equipment—selects the channel.

The MN-100A fits in a one-half ATR housing and weighs less than 13 lb.

Removable side covers make all parts easily accessible.

Flush, nose-mounted MN-92 series glide slope antenna is available for all multi-engine aircraft, the Bendix company reports.

Umbrella Hangar for Lightplanes

(McGraw-Hill World News)

Brussels—The problem of storing large numbers of light aircraft so that they can be readily moved out at a moment's notice without disturbing the others is handily solved by a pair of novel mushroom or umbrella-type circular hangars used at a student training field at Grimbergen near the Belgian capital.

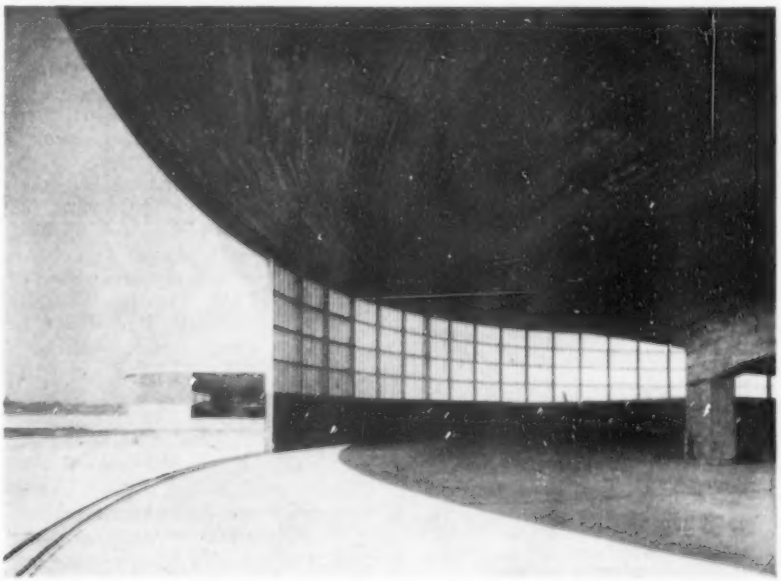
These hangars are 164 ft. in diameter and each can house up to 36 Piper Cub-size planes. Double-track sliding doors can be opened at any point so that any plane can be moved out regardless of its location. A concrete apron surrounds each hangar.

Heart of the structure is a reinforced concrete dome supported on a large hollow pillar having four wide archways. This central area is usable as workshop space. The dome supports a cantilever reinforced concrete circular overhang which comprises the main hangar space of the building.

The builders, Blaton-Aubert, Brussels, note that the complementary pattern of radial and hoop annular reinforcements embedded in the overhang absorb reflection and torsion moments. Total structural weight is 800 tons, but allowance is made for storing rain or sand on the roof which would raise the weight of the structure above ground to 1,000 tons.

Maximum headroom under the arches is approximately 9 ft. 6 in. and under the dome 12 ft.

Detailed design of the circular hangars at Grimbergen was handled by M. Chaikes from patents owned by M. Hardy of Quievrin, Belgium.



CIRCULAR HANGAR near Brussels will house up to 36 Cub-size planes in its 164-ft. diameter and permit easy movement in and out of the building.

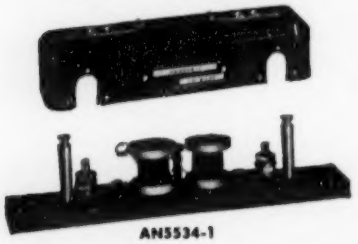
IRON CONSTANTAN — Figure A, lead-wire to specification AN-W-8. Available in type II or III class A or B. Thermocouple wire supplied in AWG sizes from 18 to 30 to Bu Stds RP1080.

COPPER-CONSTANTAN—Figure B, lead-wire used with chromel-alumel indicators, effects considerable saving in weight over chromel-alumel leads of same resistance. Available in AWG sizes or with special stranding to seven ohms per 200 feet.

CHROMEL-ALUMEL—Figure C, lead-wire to specification AN-W-29. Available in types I, II or III class A or B. Available with stainless steel overbraid. Thermocouple wire available in AWG sizes 16 to 24.

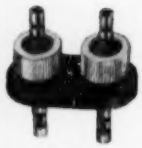
Write for data on any of above or wire to new MIL specifications.

ACCESSORIES FOR TEMPERATURE INDICATORS



AN5534-1

Developed by Lewis, the AN5534-1 resistor block is used to adjust the overall external resistance of the indicator to eight ohms.



AN5537-1

Another Lewis development, the AN5537-1 Firewall Connector Block provides a quick disconnect for thermocouple engine leads. Available with angle plugs as part AN5537-2.

TERMINALS FOR THERMOCOUPLE LEADS

In accordance with AN5539 in brass as well as chromel and alumel. In addition, we manufacture chromel and alumel terminals with longer insulation grips in accordance with the new AN5548 standards.

THE LEWIS ENGINEERING CO.

Manufacturers of Complete Temperature Measuring Systems for Aircraft

NAUGATUCK, CONNECTICUT

NEW AVIATION PRODUCTS

Many Aviation Uses Seen For Plastic-Treated Cloth

Celastic, an old product with new aviation possibilities was recently put on the market by Calahan & Horsey, Inc.

Manufactured by the Celastic Corp., a du Pont subsidiary, the product is a plastic-treated fabric, usually cotton. C&H suggests its use for forming radomes, wing tips and equipment containers.

The material's qualities which make it attractive to the aviation industry are its easy formability, lightness, durability, resistance to rot and water, and its strong adhesive properties.

▶ **Molds Easily**—It is also elastic, easy to work, and withstands a wide temperature range. The plastic-impregnated fabric becomes limp when soaked in a special liquid, called Dunk. In this condition, Celastic may be laid onto any shape of mold and will then hold its form after a setting period of about 30 min.

The mold is at first coated with a parting agent to prevent Celastic from adhering. After 24 hours, the material cures and hardens to an extremely tough but not brittle shape.

When cured, Celastic becomes very hard and resists scuffing and abrasion very well, the company says. This would make it suitable for floor covering of cargo aircraft and covering for passenger-plane entrance ways and galleys.

Distributors of Celastic say the material is completely immune to rot and is absolutely waterproof. Salt water has no effect on it. Applications indicated here are tank waterproofing and seaplane uses.

▶ **Sticks Tight**—Celastic is said to adhere with such tenacity to most known materials that removing it is extremely impossible after the plastic has hardened. Coated surface should be free of oil, loose paint or rust.

Under actual service conditions, Celastic has withstood temperatures of −60F to +140F. In the laboratory it has taken temperatures of −110F to +212F for several hundred hours, according to C&H. The material disintegrates above 300F.

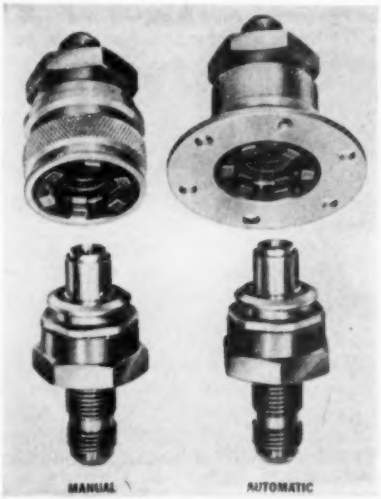
Celastic's elasticity after curing makes it highly resistant to vibration, fatigue and shock. It may be worked with ordinary wood-working tools. It may be sanded to any degree of smoothness, drilled and tapped for machine screws, but it will not hold a wood screw. It may be painted as desired.

When treated with metallic filler, supplied by C&H, it may be buffed in the same manner as any standard metal. In this application, it can be used to fill in fuselage or wing dents quickly and easily without need of riveted patches.

Celastic, which has been used in heavy industry as an adhesive and protective covering for 27 years, comes in a large variety of weights and thicknesses, depending on the application for which it is intended.

Although Celastic and Dunk are inflammable during application, after the Dunk has evaporated, Celastic is "slow-burning," according to Underwriters Laboratories, C&H claims.

Calahan & Horsey, 551 Fifth Ave., New York 17, N. Y.



Coupling Disconnects Under Full Pressure

E. B. Wiggins Oil Tool Co. is marketing a hydraulic coupling that can be disconnected under full system pressure by pulling and reconnected with a "push-pull."

Another model disconnects automatically at any desired load weight or system pressure.

Where pressure drop is the paramount concern large couplings are used on small tube lines. An example: ¾-in. fittings can be coupled to ¼-in. tubing. If weight is the main factor, undersize couplings can be used, according to Wiggins.

The company claims its units, called Inst-o-matics, are lighter than comparable couplings.

The couplings eliminate the need of shutting off the hydraulic system in an emergency in many instances, Wiggins says. They are fail-safed, always closed when disconnected, open when coupled,

and can be substituted for AN6241 and AN6242 installations without changing mounting provisions.

E. B. Wiggins Oil Tool Co., 3424 E. Olympic Blvd., Los Angeles 23.

ALSO ON THE MARKET

All-aluminum safety shoes for straight and extension ladders can be fitted with either rubber treads or spikes. They are non-sparking and are attachable to almost any metal or wooden ladder, says maker. Price: $4.50 per pair.—Aluminum Ladder Co., Worthington, Pa.

Explosion-proof version of widely used 1ML1 Micro precision limit switch, smallest of this type available, has been approved by Underwriters for use in hazardous atmospheres, Class 1, Groups C and D.—Micro Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.

Meter-relay with sensitivity of 0.2 microamperes has balanced, jeweled movement shock-mounted against vibration. Non-indicating type, it gives accurate control of temperature or actuates alarm when used with standard thermocouples. Response times range from 1 millisecond to 10 sec.—Assembly Products, Inc., Main at Bell St., Chagrin Falls, Ohio.

Tantalum strip for avionic components is highly magnetic, corrosion-resistant and has tensile properties comparable to cold-rolled steel. It is available in thin strip or foil, in 6-in. widths and thicknesses down to .0005 in. to tolerances of .0001 in.—American Silver Co., Inc., 36-07 Prince St., Flushing, N. Y.

3-D IN INDUSTRY

3-D has its place in industry as well as in the movies. This begoggled young lady is inspecting a tiny ball bearing with a stereoscopic binocular magnifier, the Magni-Focuser. Unit straps to head, leaving hands free. It is made by Edroy Products Co., 480 Lexington Ave., New York 17.

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Parts built by Associated bear this stamp. It means correct engineering, tooling, fabrication and quality control. On the final assembly it is your guarantee of dependable service in use.
Your metal fabrication requirements—designing, tooling and production—can be met on schedule by Associated. Write

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FINANCIAL

Projected Results
Aircraft Manufacturing Companies

Manufacturer	1952 Actual			1953 Estimate			1954 Estimate		
	Total Sales (Millions)	Per Share		Total Sales (Millions)	Per Share		Total Sales (Millions)	Per Share	
		Earnings	Cash Dividends		Earnings	Cash Dividends		Earnings	Cash Dividends
Bell	$128.6	$3.46	$1.50	$160	$3.85	$1.50	$160	$4.50	$1.50-2.00
Boeing	739.0	8.67	2.67	800	10.50	3.00-5.00	750	13.00	3.00-5.00
Curtiss-Wright	362.2	1.02	0.60	420	1.35	0.60-1.00	500	1.80	0.60-1.00
Douglas	522.6	8.99	3.75	825	14.50	5.00-7.00	750	17.00	5.00-8.00
Fairchild	141.6	1.36	0.60	160	1.60	0.60-1.00	160	2.25	0.80-1.20
Grumman	220.5	2.67	2.00	250	3.30	2.00	250	5.00	2.00-2.50
Lockheed	438.1	3.61	1.20	750	5.50	1.50-2.00	600	6.25	1.50-3.00
Martin	144.0	2.10	Nil	200	3.15	Nil	200	3.15	Nil
North American	315.3	2.28	1.25	500	3.20	1.50	550	4.90	1.50-2.00
Republic	412.2	7.32	1.25	475	8.00	1.50-2.00	525	11.00	2.00-3.00
United	668.2	5.18	2.00	850	6.40	2.75	820	8.75	3.00-3.50

Airline Companies

Airline	1952 Actual			1953 Estimate			1954 Estimate		
	Gross Revenues (Millions)	Per Share		Gross Revenues (Millions)	Per Share		Gross Revenues (Millions)	Per Share	
		Earnings	Cash Dividends		Earnings	Cash Dividends		Earnings	Cash Dividends
American	$187.2	$1.72	$0.50	$205	$2.30	$0.50	$220	$1.70	$0.50
Braniff	31.8	0.21	Nil	42	0.85	Nil	43	0.40	Nil
Capital	40.4	1.80	Nil	45	2.00	Nil	47.5	1.25	0.25
Eastern	118.5	3.43	0.50	145	4.25	0.50	155	3.00	0.50-0.75
Northwest	61.6	1.64	Nil	67	0.75	Nil	70	0.25	Nil
Pan American	205.2	1.09	0.50	235	1.15	0.50	240	0.80	0.50
TWA	160.7	2.30	Nil	180	2.70	Nil	190	2.10	Nil
United	159.0	4.03	1.50	180	4.50	1.50	190	3.00	1.50

SOURCE: The Value Line Investment Survey.

Survey Sees Airline Earnings Dip

Value Line expects carriers to feel 1954 profit squeeze, but finds longer-term outlook for aviation bright.

An optimistic view of aviation's future is expressed by Value Line, the investment survey, in its current issue. The bright outlook is tempered somewhat by an expected dip in 1954 airline profits, but the long-term prospect for both air transport and aviation manufacturing is considered good.

▶ **Aircraft Backlogs**—The aircraft builders, "with unfilled orders for two or three years work ahead of them . . . may be one of the few bright spots on the economic horizon next year," says the investment survey.

"Despite the decline in business activity which we envisage within the next 12 months," Value Line states, "these companies will be producing at peak rates, showing peak earnings, and paying peak dividends."

▶ **Transport Dip in 1954**—While the long-term prospects of the air transport industry are considered "bright" by Value Line, it anticipates an earnings decline in 1954 for the group. This is largely premised on the survey's projection of a 6% decline in the gross national product next year coincident with an 8 to 10% drop in the Federal Reserve Board Index of production.

"Such an economic environment would be less favorable for the airline companies than the boom economy in which they have operated so far this year," the service says. "Yet the secular growth manifest in air traffic during the past decade has been so strong that it can be expected to counterbalance the weight of a lower national income next year, just as it did in 1949."

In more specific terms, while wide revenue passenger mileage gains are anticipated for 1954, Value Line looks for dollar revenue gains of 5 to 6% compared to estimated revenue gains of 12 to 15% this year. With unit volume increasing more than dollar volume, operating costs will rise faster than revenues, causing a profit margin squeeze and a moderate decline in operating profits. Record depreciation charges will magnify the dip in operating profits, causing estimated net income declines of as much as 35% in some cases.

▶ **Looking Ahead**—Individual aviation companies are also reviewed by the investment service with projections advanced for results anticipated in 1953 and 1954—a courageous undertaking.

The forecast for 11 aircraft builders for these two years in terms of total sales, per share earnings and dividends is revealed in the accompanying table. For comparison purposes, actual 1952 results in the same categories also are tabulated.

In a similar vein, projections are advanced for eight airlines by Value Line. These forecasts also are presented in the table.

The forecasts developed by the investment service represent an interesting indication of future trends in the aviation groups. It must be recognized, however, that neither aircraft manufacturing nor air transportation are static, and completely unexpected events can and do frequently change the course of the individual companies.

(The opinions reviewed are those of Value Line advisory service and not necessarily those of the undersigned or AVIATION WEEK.)

—Selig Altschul

It's a fact, too—

Shell Aviation fuel carries the most passengers . . . the most air freight . . . the most air mail in the United States today.

*SHELL AIR FACTS

Air transportation is efficient:

On the average airline trip, it takes only slightly more aviation gasoline to carry you to your destination than is needed to fill the tank of your automobile . . . about 20 gallons per passenger.

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As flexible tubing serviceable from −65 to +500°F

SILASTIC

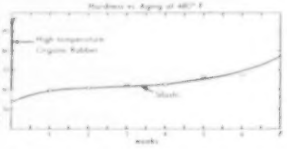
works where other materials fail!

After certain jet engines were put into service, it became apparent that ice could build up on the air scoops fast enough to cause engine failure. Jet designers knew that icing could be eliminated by piping air at 500° F from the compressor back up to the scoops. There were many problems however. The engines fit so tightly in their nacelles that there was little room left, and high frequency vibration is likely to cause fatigue failure.

Engineers of the Aeroquip Corporation of Jackson, Michigan solved the problem with flexible Silastic* tubing reinforced with stainless steel braid. The Silastic tubing is mechanically held so tightly to the stainless steel braiding that the tube will not collapse even when subjected to a vacuum. The new Aeroquip "Little Gem" fittings solved the high temperature problem of attaching a fitting to the hose.

So effectively was the job done that these anti-icing hose lines have become standard equipment. The Silastic hoses are light, unaffected by vibration, and easily assembled and disassembled. Despite internal and external temperatures as high as 500° F, the Silastic hoses are still in excellent condition after hundreds of hours of service. Aeroquip has supplied thousands of them to jet manufacturers. From 5 to 20 are required per engine, depending upon its design.

That kind of performance is confirmed by heat-aging data supplied by our Silastic laboratories (see Figure 1). Heat resistant organic rubber becomes brittle in a few hours. Silastic does not crack on flexing 180° over a ⅜ inch mandrel and hardness increased only 23 points from 54 to 77 after 7 weeks, or 1176 hours of continuous aging with all surfaces of the test samples exposed in an air circulating oven at 480° F. That's why engineers who need rubbery properties at temperatures ranging from —100 to +500° F, specify Silastic.



*T. M. REG. U. S. PAT. OFF.

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BRITONS CAN HAVE PROSPERITY —If They Want It

What is required to get Britain, our key ally in the grand alliance of the free world, firmly back on her economic feet? The purpose of this message is to throw light on this crucial problem, which afflicts our other European allies also.

At the moment, Britain is enjoying a respite from the economic crises (of 1947, 1949 and 1951-52) which have plagued her postwar course. This respite may well continue for some time. But almost no one whose judgment is trustworthy believes that Britain has acquired sufficient economic strength to safeguard her against further economic crises in the years immediately ahead.

Two British Views

New and clear light on what should be done to that end has recently been shed by two noteworthy British publications. One is a book, "We Too Can Prosper," by Graham Hutton, distinguished British economic writer and administrator. The other is an article, "The Riddle of Prosperity," published by THE (London) ECONOMIST, Europe's most eminent economic journal.

Combined, these two publications present in sharp relief the basic problem that must be handled successfully if Britain is to be safely solvent. As is implied by its title, ***the Hutton book demonstrates that Britain can be made prosperous by readily feasible procedures, patterned on what has been done in the United States, to increase its industrial efficiency. But, says THE ECONOMIST, with Mr. Hutton's book in mind, this is not the most basic problem, which is, "How shall we make the British people determined to be prosperous?"*** This is a problem of incentive or motivation.

Compared with that of the United States, average industrial efficiency in Britain, as in most of Western Europe, is low. In his book Mr. Hutton remarks that "fifty years ago an American industrial worker turned out roughly the same amount in a day as his opposite number in Britain, Germany or France. . . . Today, he turns out from two to five times as much."

In large part it is this lag in output per hour or "productivity," as the technicians call it, which makes Britain and other key countries in Western Europe a continuing prey to economic crises. Moreover, the great disparity in productivity between the U.S.A. and most

of Western Europe is a major barrier to knitting the free world into a smoothly working economic whole. As one observer put it, "when the American economy catches a cold, the European economy gets pneumonia." This is largely because Europe is so much weaker in productive strength.

No Shortage of Knowledge

Yet the knowledge which would enable the countries of Western Europe, and particularly Britain, to increase their industrial productivity has been mobilized and is readily available to them. It is with this process for Britain that Mr. Hutton's book is concerned. In the book he summarizes the findings and conclusions, virtually all of them unanimous, of 66 teams, composed of British industrial managers, technicians, shop workers and labor leaders. Over a period of three years these teams completed a comprehensive series of inspection and study trips in the United States under the sponsorship of the Anglo-American Council on Productivity. The product of that effort, he remarks, is "a set of documents the like of which, on such a scale and of such practical value, has never been seen in the history of international and cultural borrowing."

Psychology the Key

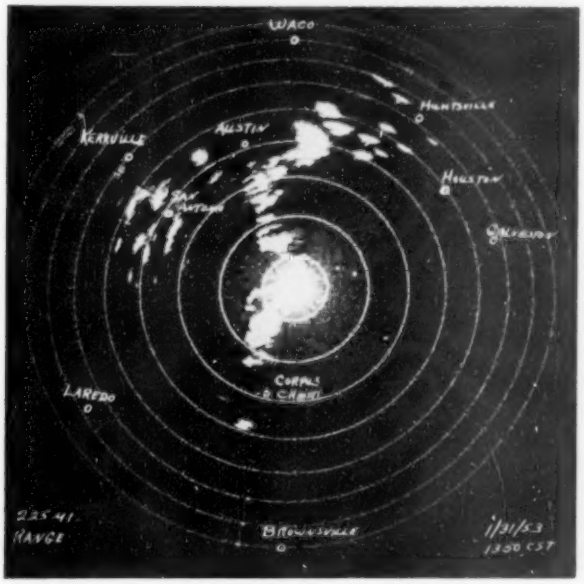
From study of these documents, Mr. Hutton concludes that better capital equipment is the key technical ingredient of higher industrial productivity in Britain, and constitutes "the most urgent . . . need of British industry." But he finds that ***even without new capital equipment a "15% rise in productivity can still be achieved by reorganization of work," and that such an increase would "solve Britain's chief social and economic problems."***

Then why is not such an increase in productivity, demonstrated by the Anglo-American productivity teams to be so clearly within technical grasp, promptly forthcoming? Mr. Hutton, quoting one of the team reports, remarks that, ***"'the greatest obstacles to increased productivity are psychological rather than technical.'*** We have to deal first and foremost with men, not machines." And THE ECONOMIST, pursuing the line of inquiry suggested, reaches the conclusion that, by and large, the people of Britain do not want to prosper by being more efficient. THE ECONOMIST says:

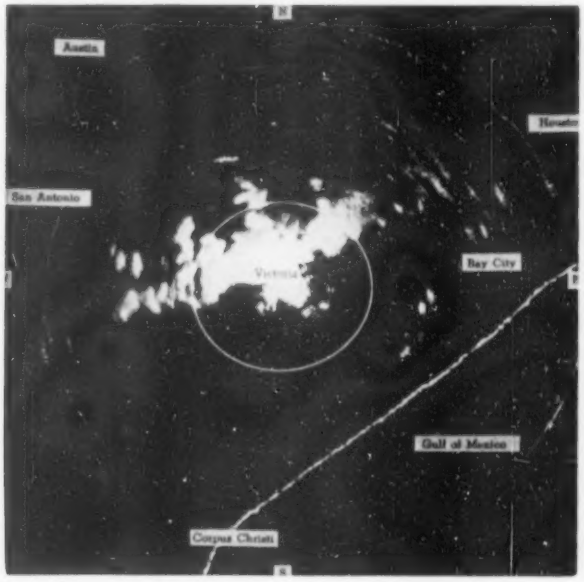
> "The real secret of American productivity is that American society is imbued through and through with the desirability, the rightness, the morality of production. . . . But in Britain, if any moral feeling at all survives about economic matters, it is usually a vague suspicion that economic success is reprehensible and unworthy. From this difference in attitudes everything else follows."

"How," asks THE ECONOMIST, "shall we set about restoring some belief in the rightness of effort, the morality of success?" For this question it has no ready answer. Neither have we. We are confident that the British people will neither be cajoled nor coerced into trying to match our productivity. Basically the problem seems to be to demonstrate clearly to them the truth of the proposition, set down by Graham Hutton, that "there is no goal, aim or end before a Good Society which the raising of that society's material productivity cannot render easier of achievement." Doing that in an old and settled country like Britain is obviously an extremely formidable undertaking. But ***until it is done, the crucial job of getting Britain and the rest of Western Europe firmly on its economic feet will remain to torment all of us.***

McGraw-Hill Publishing Company, Inc.



STORM-TRACKING RADAR covers 125,000-sq. mi. area.



RADAR permits detouring planes around storm center.

New Avionics Gear Aids Airline Reliability

- **Improved equipment and procedures installed at U. S. airports cut cancelations to 4% of scheduled flights.**
- **But mechanical failures in aircraft and lack of spares may set back carriers' high rate of completed trips.**

By Lee Moore

New all-weather flight equipments and procedures now coming into general use are moving airlines a long step nearer their ultimate goal of perfect schedule reliability.

Cumulative effect of the improvements this year probably will put the U. S. a vital 1% closer to total mastery of the air in commerce, as well as war.

Airlines completed 96% of their scheduled flights last winter, compared with 95% the year before. Bad weather and mechanical failures canceled 4% of scheduled flights.

Conquering that last 4% may be impossible. That is why a 1% gain in one year is a great event, although its day-to-day achievement is undramatic.

▶ **Mechanical Problems**—Despite rapid improvement in all-weather operation, other problems actually may set schedule reliability back for a time, according to Milton Arnold, Air Transport Assn. vice president-engineering and operations.

He cites saturation of facilities because of the boom in air travel both in airlines and executive aircraft. Scheduled airline mileage flown has gained more than one third since 1950.

When airline load factors are high, mechanical failures cause cancelations that would be unnecessary if spare aircraft were standing by, as they are when business is not so good. An example of this was the winter of 1950-51 when schedule completion rate equaled that of last winter.

▶ **Beating the Weather**—This year's crop of improvements in all-weather operation include: complete radar traffic control; static-free navigation and communications network throughout the country; radar-eyed "weather advisory service"; standardized approach, runway and taxiway marking; inexpensive (less than $10,000) airport approach system (TVOR); slant-visibility airport weather reporting, and direct, long-range traffic control communications.

Here is a progress report on implementation of some of the most important:

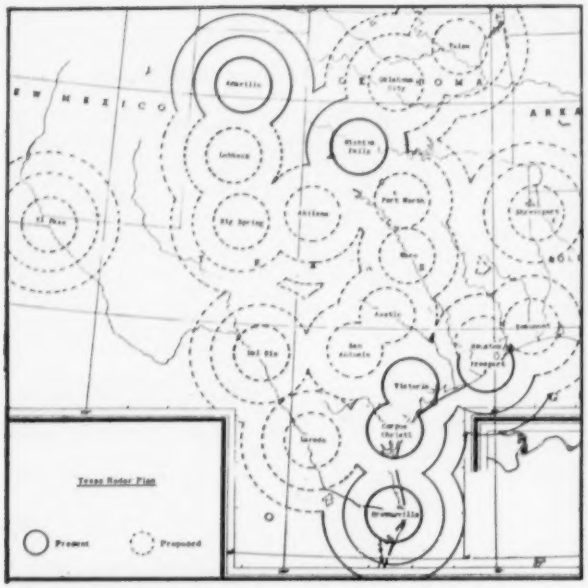
• **Radar traffic control**, in various stages of implementation, is now the instrument-weather control system at Washington, Chicago, New York and several other busy areas. Federally owned Washington National Airport starts each new step in the implementation program toward total radar control.

Next step: increase the radar-control limit to include all operations when visibility is less than five miles (currently three miles) and establish an 180-mph. speed limit on all planes within a 15-mile radius.

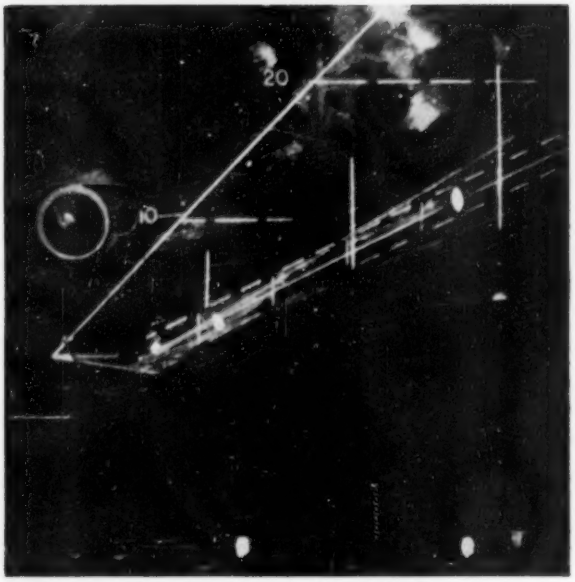
Civil Aeronautics Administration already reports the following improvements in Washington National Airport capacity during instrument conditions: Before the radar program, total instrument-approach delay time during November 1951 was 29 hr. 5 min. with 683 instrument approaches, or .04 hr. per approach. The most comparable month this year was January, with total delay reported at 2 hr., 10 min. on 1,519 approaches, or .001 hr. each. Airport capacity under socked-in conditions increased from 184-236 arrivals on typical days in 1951 to 294-316 arrivals in 1952.

Airport surveillance radar formerly was used primarily as a monitor, an addition to the conventional system of stacking planes over points and bringing them in on the beam of the so-called instrument landing system equipment.

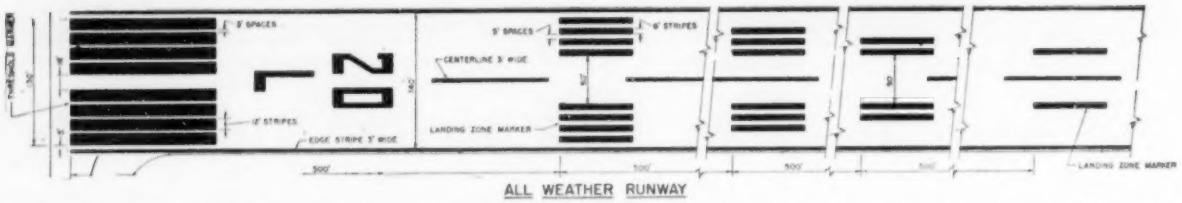
Radar traffic control implementation



"TEXAS PLAN" requires 15 more radars to cover state.



PAR being used at airport for close-interval landings.



ALL WEATHER RUNWAY

STANDARDIZED RUNWAY MARKINGS on all-weather runway make it possible for pilot to know how much runway he has left.

started with departure control in early 1952. By summer, the controller managed approaches, too, on a limited basis. By September 1952, arrivals were controlled fully under conditions worse than the standard three-mile-visibility limit on visual navigation.

• **Very-high-frequency** (VHF) omnirange navigation and communications became the rule rather than the exception on major airways this year—and also is becoming the standard in Europe.

Reliability under all-weather conditions is the main advantage. It is static-free, permits much more precise navigation in all areas reached by its line-of-sight transmissions.

• **Terminal omniranges** (TVOR) are going into airports not busy enough to justify cost of the complete instrument landing system and a radar.

The "baby omni" is similar to the powerful enroute omnis operated by CAA but are lower powered, not as expensive and lack standby transmitter.

Corporations, airlines and state and municipal governments started buying the equipment this year. A few already are operating. Mohawk Airlines is evaluating TVOR's possibilities under sponsorship of ATA.

• **Radar storm avoidance** by air-ground contact with Air Defense Command is operating under a trial ADF-CAA-Weather Bureau program in five Central and Middle West defense zones. This ground vector system will help bridge the time gap before faster, newer transports get simple, effective airborne radar of their own.

Under the trial program, pilots contact a CAA air route traffic control center. The center calls Air Defense Command. ADC either relays the information or gets in touch directly with the pilot.

Weather Bureau has experimented with this-type operation on a limited scale, but lack of funds to install many radars has prevented routine aircraft vectoring. The bureau has been modifying war surplus radars at the rate of five per year.

Now Weather Bureau is negotiating with Texas universities and civic authorities for a cooperative "Texas Plan" to blanket the state with such ground radars. This would vector pilots around storm centers and improve farm, forest, flood and general forecasting.

Bureau sources expect to conclude an agreement with Texas A & M to lead off on the program soon.

• **Improved ILS approach beams** have been installed in approximately half the nation's 128 instrument landing systems now operating. Remaining sets and all new installations are being modified as CAA funds permit.

The improvement is largely a null-reference antenna on the glide slope

Airline Winter* Performance

	Flights Completed	Miles Flown
1953	96%	240 million mi.
1952	95%	216 million mi.
1950	94%	175 million mi.
1947	91%	164 million mi.

* Six months ending each Mar. 30, scheduled domestic airlines. Source: CAB.

that tells the pilot if he is too high or low throughout his landing approach. The new beam is less sensitive to weather, snow and terrain and has sharper focus. It is more reliable.

• **Standardized layout** for high-intensity approach and runway lighting, runway ground markings and taxi signals have been a plea of pilots for many years. However, it was only recently that CAA resolved the military, industry, and personality pressures.

On approach lights, CAA finally agreed with European and U.S. pilot and airline preference for the simple centerline system.

CAA also has issued an order standardizing runway striping to tell pilots how much room they have left to roll during touchdown and throughout the landing run. Signs and lighting for runway and taxi strips are being standardized so that pilots will be "lost on the ground" less often in the maze of airports' differing physical layouts.

• **Traffic control communications** for approaching aircraft now start as far out as 100 mi. from the congested New York terminal area. This is called the "peripheral" communications system. It eliminates the last-minute haste of routine instructions to pilots when they are close in where direct VHF communications are possible.

By stringing phone cable to remote, automatic transmitter-receivers in outlying areas, CAA control center in New York is expanding the range of (and time for) communications.

• **Approach visibility** and cloud-ceiling reporting always have been a problem for Weather Bureau and traffic controller at airports, because their instruments were too near the area where the plane makes its final approach.

New remote-operating equipment already is improving this situation at airports that have it (AVIATION WEEK Aug. 24, p. 48).

Douglas Sees Drop In Equipment Demand

Los Angeles—Demand for new airline equipment is expected to slacken as a result of the heavy re-equipment program of the last eight years, according to Frederick E. Hines, financial vice president of Douglas Aircraft Co.

Douglas now is devoting a large part of its total engineering force to guided missiles, now reaching the production stage, Hines said. This may indicate cool airline reaction to Douglas DC-8 turbojet and DC-9 turboprop proposals.

▶ **Foreign Market**—Hines said purchases of new commercial aircraft are expected to fall off until the "airline companies' financial position can be strengthened by the payment of debt through the generation of cash from depreciation charges."

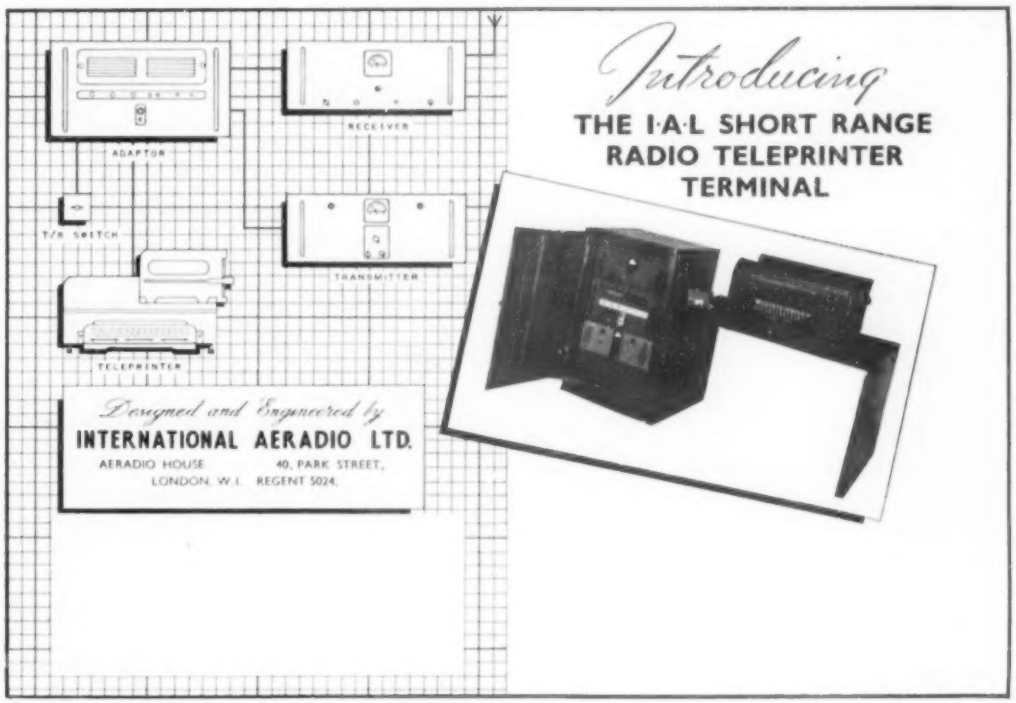
His remarks were in a speech before the Los Angeles Society of Security Analysts.

Hines said the need of foreign airlines for new equipment is more urgent than that of U.S. carriers, although foreign sales are curtailed at present because of scarcity of free dollar balances abroad.

▶ **Backlog**—Current and future production schedules provide sufficient business to last the company through and possibly beyond 1955, the Douglas vice president declared, with backlog of uncompleted Douglas contracts standing at nearly $2 billion as of May 31.

"We are told that neither the armed truce in Korea nor the $5-billion reduction in military appropriations will have anything more than minor effect upon the company's military aircraft program," Hines stated. "Within a relatively short time, however, political negotiations should commence which might result in substantial lessening of international tension."

This could result in curtailment or slackening of military aircraft production, he said.



PAA Division Wins $11.3-Million Subsidy

Civil Aeronautics Board has proposed a final subsidy of $11,320,000 a year for Pan American World Airways' Latin American Division effective from last Jan. 1 forward.

The Board estimates the PAA division should net $3.5 million annually after taxes with this rate.

Total proposed mail pay of $13,171,000 is made up of the subsidy plus an estimated $1,851,000 straight cost compensation for mail service at 59 cents a ton-mile.

The $13-million total is $5 million more than CAB gave Pan American in 1951. (The 1952 rate is not yet settled.)

In its opinion and show-cause order, the Board cites three major reasons for the big increase since 1951:

- **Nonoperating income** of LAD in 1951 was $1,777,000 more than estimated for typical future year.
- **Return on investment** subsidized for the future period is higher because CAB grants a 10% return for a future period, compared with 7% for the riskless past. Investment base has increased because of company growth.
- **Income tax** estimated for the future year is $2,511,000 more annually than the 1951 payment was.

"Nevertheless," the Board adds, it "is concerned by the high level of subsidy still required for the carrier's Latin American operations."

▶ **Significant Changes**—CAB recently set Pan American's 1951 subsidy, disallowing a substantial amount of expenses and investment. The company since has acted "commendably" to reduce schedules that the Board considered excessive capacity.

CAB's projection on the future rate notes several "significant changes" from the 1951 operation:

- **DC-6Bs replaced B-377s** on service to Buenos Aires "without apparent loss of traffic and with increased load factors."
- **DC-4s replaced C-46s** on all-cargo operations.
- **Tourist service increased** to San Juan, P. R.
- **Other LAD coach services** now are on more modern equipment than the DC-4.

▶ **Subsidy-Less Route**—The Board has decided to end subsidy to PAA's New York-San Juan service, effective last Jan. 1. It is a high-density, long-range route that yields a profit without subsidy, CAB says.

Eastern Air Lines has operated the same route since 1951 without subsidy. CAB therefore grants Pan American only the straight 59-cent-a-ton-mile rate for this mail service.

▶ **$4-Million Cut**—PAA told the Board it probably would need $9.5 million a year to break even. CAB cut this to $5.5 million.

Probable major adjustments:

- **More commercial revenues,** $315,000.
- **Lower depreciation and amortization** on L-49 Constellations.
- **Other depreciation** and residual-value adjustment, $520,000.
- **Limit of selling expense** to 19% of total commercial sales, $745,000 reduction.
- **Limit of administrative expenses** to 12% of total expenses (excluding San Juan services), a $76,000 cut.
- **Pilot featherbedding,** $1,233,000 cut. Pan American pays pilots for flying done by Panagra crews on PAA's Miami-Balboa route. CAB said it "does not find warranted a double payment of flight personnel salaries in subsidy rates."

Honolulu-Tahiti Line Wins CAB Certificate

Civil Aeronautics Board has certificated South Pacific Air Lines for Honolulu-Tahiti service, tentatively scheduled to start by the end of this year (Aviation Week July 6, p. 83).

The Board limited the certificate to two years, subject to renewal. SPAL neither requested nor received subsidy.

On the West Coast, meanwhile, the carrier's president says Civil Aeronautics Administration has not vetoed SPAL's plans to use Short Solent flying boats on the new route.

First report that the plane would not be used came from Richard K. Kimball, a director of South Pacific. He said CAA ruled the flying boat could not be used for the entire run unless new and more powerful engines were installed or the load limit reduced. Kimball said the plan was to fly a DC-4 or DC-6 from Hawaii to Bora Bora and complete the run with a Solent.

But M. S. van Burkleo, South Pacific president, declares: "The CAA has positively made no ruling regarding the Solent. We can see no reason, at the present time, why the Honolulu-Tahiti service will not be inaugurated as planned.

"The Solent flying boat is an aircraft that is completely unknown to our Civil Aeronautics Administration and, as such, must be studied by them before licensing can be accomplished. We were well aware of this fact when we completed purchase of the boats."

Tourist Gains

Tourist air travel to Hawaii is nipping first-class flights.

United Air Lines will increase tourist roundtrips from California from four a week to eight Sept. 8 but, at the same time, will cut its first-class roundtrips from 12 to 6.

The move represents the first time aircoach travel seriously has set back luxury flights on Pacific routes.

The extra seats on each tourist plane (67 vs. 55) will reduce the cutback in total UAL capacity and shift traffic from Stratocruisers to more economical DC-6s.

Pan American World Airways, which inaugurated tourist fares last December, has jumped from three coach flights a week to six and to nine with no cutback in first-class flights.

Venezuela Signs Air Route Pact With U.S.

(McGraw-Hill World News)

Caracas, Venezuela—The Venezuelan government signed its first bi-lateral air transport treaty with the United States this month after nearly three years of negotiations.

The international air routes mutually conceded: three for Venezuelan lines to America, five for U. S. lines to Venezuela. Each government may name the airline(s) to provide its service.

The compact makes effective a separate agreement signed Aug. 7 between the Venezuelan government and Pan American World Airways.

The treaty sets up the following routes for U. S. air service to Venezuela: Eastern zone of the U. S. via Puerto Rico, the Dutch Antilles, Caracas, Brazil and beyond; Eastern zone of the U. S., except New York, via Cuba, Haiti, Dominican Republic and Dutch Antilles to Caracas; Eastern zone of the U. S., except New York, via Cuba, Jamaica and Colombia to Maracaibo; Central zone of the U. S. via Cuba, Jamaica and Dutch Antilles to Caracas; Canal zone via Colombia to Maracaibo and Caracas, Trinidad and beyond.

Venezuelan service to the U. S. involves these routes: Venezuela, except Maracaibo, via Dutch Antilles, Dominican Republic and Cuba to New York and into Canada and beyond; Venezuela via the Dutch Antilles and Jamaica to Miami; Venezuela via Jamaica to New Orleans.

TAL Asks Honolulu Route Without Subsidy

Transocean Airlines petitioned Civil Aeronautics Board for a new service to Hawaii and three certificated carriers asked to keep their West Coast-Hono-

lulu flights in route-renewal hearings now completed.

Here are their positions:

• **Seattle, Portland.** Northwest Orient Airlines and Pan American World Airways agreed their two routes from Portland and Seattle to Honolulu are one too many to earn money for either carrier, but each said the other should get out.

• **Los Angeles.** United Air Lines asked renewal of its Los Angeles-Honolulu route. Pan American did not oppose it. (PAA holds permanent rights in San Francisco and Los Angeles, UAL in San Francisco only.)

• **Oakland, Los Angeles.** Nonsked Pacific operator Transocean asked rights to give non-subsidy passenger and cargo service from Los Angeles and Oakland to Honolulu. Pan American and United opposed this.

▶ **United DC-7 Plans**—United's Ray Ireland said the company would replace first-class Boeing Stratocruiser service to Hawaii with Douglas DC-7s and would increase DC-6B aircoach service in September. He described the Stratocruiser as unbeatable in luxury attraction but is uneconomical.

Ireland said PAA's Stratocruiser competition to Hawaii induced United to buy the plane originally. He did not indicate what UAL would do with its Boeing transports when DC-7s replace them.

SHORTLINES

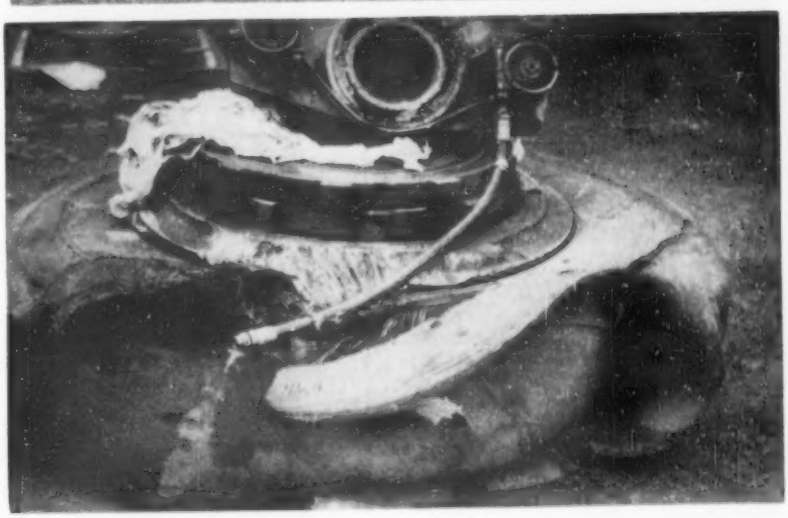
▶ **Aero Portuguesa,** one of Portugal's three civil airlines, has ceased operations; its function has been transferred to Transportes Aeroos Portugueses (TAP). That leaves Portugal with TAP, an international airline, and SATA, which provides air service to the Azores.

▶ **Air France** receipt of turboprop Vickers Viscounts has been delayed, partly by a late decision to substitute some American-built equipment. . . . Company has three de Havilland jet Comet 2s on order for delivery early in 1955.

▶ **Allegheny Airlines** president Leslie Barnes says the company will reduce subsidy requirements steadily while increasing earnings. Company earned $72,109 in fiscal 1953 (ended June 30) with less subsidy than fiscal 1952, when it lost $142,537. Policy changes under the new president include locating salesmen in the towns served, aggressive advertising, joint office with Mohawk Airlines at Newark.

▶ **British Overseas Airways** starts London-Trinidad service once a week in October, competing with U.S. carriers.

Comet Lands at Wrong Airport



Two top photos show what happened to tires of a BOAC Comet that landed by mistake at small Juhu Airport near Bombay on July 16. Tires burst when pilot tried to brake the landing run in the short field. Arrows in top photo indicate how wheels were worn while scraping ground. Bottom photo shows plane, after being fitted with new wheels prior to takeoff. The pilot had been instructed to land at nearby Santa Cruz International Airport on a runway nearly parallel to the one he touched down on at Juhu. He realized his error as soon as he landed 900 ft. from the start of the 3,600-ft. strip and applied full brakes. The jet transport skidded sideways for 300 yd. and burst all eight tires of its main gear. The landing gear struts withstood the heavy loads. After being fitted with new tires, plane took off lightly loaded in 650 yd.

▶ **Egyptian Airlines** will get all the customers that are employed by the government. Council of Ministers decreed that employes and other persons traveling by air on government business must use the carrier. Where that is impossible, tickets on other lines must be bought through Egyptian companies.

▶ **International Civil Aviation Organization** legal committee meeting started last week in Rio de Janeiro to study international legal rules limiting liability of air carriers for damage from accidents to passengers, baggage and cargo.

▶ **Korean National Airlines** is pushing for a Korea-U.S. civil aviation agreement to establish connecting air services.

▶ **Northwest Orient Airlines** asked CAB to add Seoul, Korea, to its certificate. NWA now serves Pusan three flights per week. Company says it expects a sharp increase in traffic to Korea as the country is rehabilitated . . . Northwest's schedule revenue passenger-mile traffic gained 20% in July from a year ago. Total plane-miles gained 19%. Passenger load factor was 63%, compared with 67% a year ago.

▶ **Pacific Northern Airlines** passenger-miles in July gained 38% from year ago. Cargo traffic doubled.

▶ **Sao Paulo, Brazil,** traffic through Congonhas Airport reached nearly 500,000 passengers in the first five months of this year. . . . Local airlines face a parts shortage due to curtailment of government dollar allocations.

▶ **Scandinavian Airways System** and KLM Royal Dutch Airlines have won a permit from Russia to fly over the Soviet zone of Austria without getting individual authorizations for each flight. Night flights still are banned, and all flights must be by schedule or special permit.

▶ **Swissair** passenger traffic the first half of this year gained 33% from year ago to reach a total of 83 million revenue passenger-miles.

▶ **United Air Lines** has asked CAB to approve a 14% increase in eastbound rates on specific commodities, effective Oct. 1. . . . UAL also proposes to eliminate half-fare rates for children under 12 traveling alone. Lone children require extra service attention, United says, and fare should be commensurate. . . . The company is subject of an appraisal by Selig Altschul, aviation consultant. Study was made on the basis of survey trips over the carrier's system with special emphasis on the Denver maintenance base and San Francisco operations center.

SEARCHLIGHT SECTION

(Classified Advertising)

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A growing internationally recognized Aircraft Service organization, performing modification, overhaul, repair & maintenance for both commercial & military customers, now entering a new facility construction program offers to a graduate engineer (or equivalent) a ground floor opportunity.

Applicants should have broad exp. Aeronautical structures design, Stress analysis, or electrical or Hydraulic system design.

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LOCKHEED

Aircraft Service International

Hangar #1

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An established aircraft instrument and accessory manufacturer seeks a merchandising expert to market a new flight instrument of wide application in the airline executive transport and military markets. The man we are thinking of should be of high caliber with a thorough knowledge of aviation national distribution and military procurement. He should be able to point to a successful record in a similar line. Answer fully including salary requirements. Replies held strictly confidential.

SW-8405, Aviation Week
330 W. 42 St., New York 36, N. Y.

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MR. R. T. BARTLETT

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Main Office and Plant: Bay Shore, L. I., N. Y.
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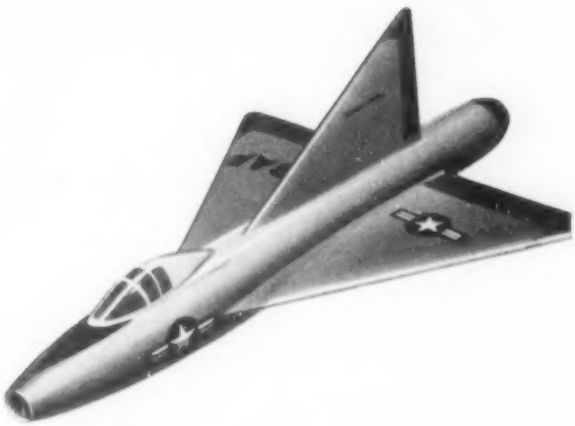

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Beyond the obvious fact that Convair in San Diego offers you a way of living judged by most as the nation's finest from the standpoint of weather, beauty and interesting surroundings, the Convair Engineering Department offers you challenges found in few places.

It is, we believe, an "engineers" engineering department—interesting, energetic, explorative — with the diversity that means security for capable personnel.

As proof, consider this: Convair developed and flew the world's first turbo-prop airplane, first delta-wing airplane, first delta-wing seaplane — engineered and built the world's biggest transport, the world's safest high-performance commercial aircraft.

Or this: Convair's B-36 is the world's largest operational bomber, Convair's B-24 Liberator was World War II's most used heavy bomber, Convair's XP5Y-1 holds the world's endurance record for turbo-prop aircraft.

Or this: Convair has been awarded the nation's first production missile contract and the first production contract for supersonic interceptors.

Currently . . . Convair has the greatest diversity of aircraft engineering projects in the country, including high-performance fighters, heavy bombers, large flying boats, transports, trainers, seaplane fighters and guided missiles.

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Would you like to join us? We earnestly need engineers of proven ability — men who want to make full use of their time, their minds, their skills and abilities solving the complex problems confronting us in these projects. If you are such a man, write us and we'll send you a free booklet about us, plus other interesting material to help you make the decision.

Write: H. T. BROOKS, Engineering Personnel
Department 200

CONVAIR

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in beautiful San Diego California

A Message to Engineers from Walter Tydon*

"A secure future, exceptional opportunities for advancement, and a high starting salary await you at FAIRCHILD, if you are one of the men we are looking for. We have openings right now for qualified engineers and designers in all phases of aircraft manufacturing; we need top-notch men to help us in our long-range military program: turning out the famous C-119 for the U. S. Air Forces.

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"If you feel you are one of the men we are looking for, write me. Your inquiry will be held in strictest confidence, of course."

Walter Tydon

** Walter Tydon, widely known aviation engineer and aircraft designer and veteran of 25 years in aviation, is Chief Engineer of Fairchild's Aircraft Division.*

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FAIRCHILD *Aircraft Division*
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AERONAUTICS DESIGNER and engineer on Helicopters. Must be top grade. Compensation will meet with qualifications. Write P-8862, Aviation Week.

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A and E Mechanic—Desires position with Corporation—Recent experience on Executive Aircraft—13 years in aviation including Airline, all Phases conversion and maintenance. Age 33—Married—Three children—Willing to relocate—Available now. PW-8575, Aviation Week.

REGULAR AF Colonel—Age 35—Stanford and University of California alumnus—Highly specialized in Personnel and Facilities Security with post graduate degree and 15 years comprehensive experience in the field. Considerable experience in writing. Presently Director of Security of a federal agency operating on a 175 million dollar annual budget. Hold current ATR in DC-4—with 7000 logged hours in multi-engine equipment. Desire to affiliate with large aircraft manufacturer or scheduled air carrier with opportunity to contribute the primary consideration. Starting salary $10,000. Available on or about 1 November. Address inquiries to PW-8894, Aviation Week.

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EXECUTIVE PILOT, Co-Pilot: 12 years flying, 2 years executive pilot on DC-3 and D-18S, commercial with instrument, over 3,000 hrs., X-Navy. Aero engineering graduate, A&E, married, age 31, resume on request. PW-8885, Aviation Week.

PILOT: MULTI Eng. land and seaplane, 11,640 hrs over 20 yrs exp. instrument and instructors rating. Married, 4 children. PBY 2067, Grumman 1120, DC3 3183, Twin Beech 1840, C46 2289. Misc. aircraft 1150 hrs. Presently employed by airline. Would like executive — corporation or private company. PW-8797, Aviation Week.

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Are you a specialist or a recent graduate proficient or interested in one or more of the following fields?

- **Aero-thermodynamics**
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HELICOPTER PILOT, available from Oct. 1st. Fixed wing comm. Single and multi-engine. 9 years flying experience. Will travel. PW-9024, Aviation Week.

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DESIGNERS — ELECTRO-MECHANICAL

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ASSIGNMENT — you will assist in the installation, operation, and maintenance of our equipment at aircraft plants and Air Force bases. The work will include liaison between AC and the customer, training of customer personnel, analysis of problems, and recommendations for improvements. Many of these outstanding openings are one-year overseas assignments.

YOUR BACKGROUND — your educational background can be in any of the fields of AE, EE, ME, Physics, or equivalent. To be successful in these positions you should have a definite interest in people as individuals and be willing to relocate to field assignments. Single men given preference.

TRAINING — our theoretical and applied in-plant training (here in Milwaukee) will prepare you for these assignments. In addition to your salary, you will receive a field allowance—and a substantial bonus if selected for overseas assignment . . . if you're looking for an opportunity with a "present" and a *future* write us for further facts.

We need men of high caliber, experienced in the field of airborne automatic electro-mechanical control equipment. You will be engaged in the manufacture and development of highly complex equipment of the most advanced type in a steadily expanding division of our company—a division with 20 years of successful operation in the precision instrument field. We offer many advantages to those who join our organization—
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Medium sized manufacturing company in midwest looking for capable pilot 30 to 35 years old with ambition and aptitude for career in sales department. Will pilot small twin engine aircraft and work in sales organization. No previous sales experience necessary. Pilot qualifications desired: 2000 hours with Air Transport Rating. Considerable experience Airways and Instrument flying as first pilot in multi-engine equipment. Junior Captain preferred. Replies should include picture (if available) and brief outline of personal history, flight experience and present position. State salary required. All replies strictly confidential. Write

P-8813, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

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SW-8107, Aviation Week
330 W. 42 St., New York 36, N. Y.

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These are responsible positions with a leader in the development, design and manufacture of fighter aircraft and guided missiles for over thirty-six years. The many company benefits for employees include liberal moving allowances. Adequate attractive housing is readily available in the Dallas-Fort Worth area.

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P. O. Box 5907 Dallas, Texas

DIVISION OF UNITED AIRCRAFT CORPORATION

C-54D

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Hydromatic propellors, recent 1000 hr. inspection. Engines overhauled by the Pratt & Whitney factory. Price very attractive.

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Luxury Type "Landseaire"

(PBY5A) owned by Fullerton Oil Company & custom built by Southern California Aircraft Corporation. Total Time since conversion 490:00; P&W R1830-75 Engines; Full Airline Radio Equipment.

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EXECUTIVE AIRCRAFT

Military configuration currently flying. 786 hours total time since new on airframe, engine and propellers. In good condition throughout. Available immediately for executive conversion. All inquiries on Company letterhead answered.

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Has in Stock Today
Collins **17M** 50 watt 360 Channel VHF Transmitter
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Excellent Condition
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C18S and D18S Transports—Excellent Condition fully equipped from $25,000
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OFFICIAL PROPOSALS

Bids: October 8, 1953

Notice of Public Sale of Property

Public Notice is hereby given that the Indiana State Agency for Government Surplus Property, County of Marion, State of Indiana, by and through its Director, of Division of Public Works and Supply, will offer for sale for junk, to the highest bidder, all bids must be delivered to Director, Division of Public Works and Supply of State of Indiana on or before one (1:00) o'clock P.M., Central Standard Time on the 8th day of October, 1953, at Room 404 State House, Indianapolis, Indiana, said property will be sold in accordance with the conditions set forth below. The property offered for sale hereunder is located at Freeman Field, Seymour, Indiana, and is to be removed within thirty (30) days after purchaser is notified that he is the successful bidder. The property is described as follows:

No. 1. Combat Type Aircraft, U.S.A.A.C.—P-43, Serial No. 40-2903, Order # W 535 A.C. 13839, Date 9-2-41

No. 2. Combat Type-Pratt & Whitney Aircraft, U.S.A.A.C.—P-51 A-1,—NA, S.N. 43-6178, Order #A. C. 30479, Date 5-28-1943.

No. 3. Combat Type Aircraft, P-63-A-BE, A.A.F. Serial No. 42-68870, 2688.

Bids shall be submitted for reduction of the aircraft to scrap for its basic material content.

Written proposals must be sealed and filed on or before 1:00 P.M., Central Standard Time on the 8th day of October 1953, with John A. Cartwright, Director of Division of Public Works and Supply of State of Indiana, at Room 404 State House Indianapolis, Indiana. Each sealed bid must be accompanied by security in the form of a certified check or a bidders bond, made payable to the State of Indiana in an amount equal to ten (10%) per cent of the total bid. Said checks or bonds will be returned to the unsuccessful bidders, and the check or bond of the highest bidder will be held to assure payment of the balance of the purchase price. The sale shall be for cash, by certified check, cashier's check or money order, made payable to the State of Indiana, upon delivery of a letter of award, with a bill of Sale to follow.

The Indiana State Agency for Government Surplus Property, sells only its vested rights and interest in the property. All property is offered on an "as is" and "where is" basis.

The property is now subject to inspection by prospective bidders. Arrangements for inspection may be made with, Guy R. Hamlin, 435 Carter Blvd., Seymour, Indiana, telephone number 1338.

The Indiana State Agency for Government Surplus Property, by and through John A. Cartwright, Director, of Division of Public Works and Supply for State of Indiana, reserves the right to reject any and all bids or to withdraw the property from sale. All bids submitted shall be deemed to have been made with the full knowledge of all of the terms conditions, and requirements herein contained.

The failure of any bidder to inspect, or be fully informed as to the condition of all or any portion of the property offered, will not constitute grounds for any claim or demand for adjustment or withdrawal of a bid after offering. A non-collusion affidavit and invitation bid, and acceptance form will be furnished to all bidders.

No award will be made until written approval is granted by the Federal Security Agency.

Indiana State Agency for Government Surplus Property.
By: John A. Cartwright, Director, Division of Public Works and Supply, State of Indiana

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Either way our 20 years of experience and nation-wide contacts are at your service in Personal, Executive and Transport Aircraft.
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To trade for Lodestar, or DC3 with P & W's, preferably without interior.
BEECHCRAFT C18S—C45 NOSE
Fully equipped; excellent condition; low engine time SMOH.
THE NORMAN LARSON CO.
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Check these features ! !

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20°-40° Cooler Running
700 HP Easy Cruise
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Less Fuel per Mile
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P&W 1830-92 ENGINES

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Licensed for scheduled airline use. Large cargo doors, cargo floor. Janitrol heater. Full radio equipment.

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Completely Overhauled
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Collins 17L VHF Transmitter
Dual Collins 51R VHF Omni
Collins 51V UHF Glide Slope
RTA-1B, R89B 6-Channel Glide Path
Three-light Marker Receiver
Dual ADF, Remote Compass
Isolation Amplifier
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Lear LVTR-36 VHF Transceiver

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DC-3 SPECIAL EXECUTIVE $88,000

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D18S Four Executive Twin Beechcrafts $45,000 And Up

Taken in Trade on Remmert-Werner Executive DC-3s
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LETTERS

Defends Cochran

Reference your letter, "USAF and Cochran," (AVIATION WEEK July 13, p.98) I am writing to try to give a little resume in justification, plus perhaps a little clarification, on the recent record flights made by Miss Jacqueline Cochran.

My position at Edwards AFB is Chief of the Flight Test Operations Laboratory and I was responsible for conducting the flights made by Miss Cochran in both the T-33 and Canadair F-86 airplane. I cannot understand why Hq USAF was embarrassed about the questions contained in Mr. Scully's letter because of the efforts and flights that Miss Cochran made here. In my opinion, they were of great value to both the USAF and to the citizens of the U. S.

It should be pointed out also that Miss Cochran was working as an official advisor to General Vandenburg, thus perhaps making her flights semi-official.

Further, the statement made by Hq USAF that the "day-to-day flight testing programs at Edwards AFB were disrupted while she hung up the records" is not entirely true, inasmuch as General Holtoner, the Commander of this base, had issued instructions to me that no flight test programs would be disrupted and that no personnel were to be tied up with her flights that would in any way hinder the mission of the Flight Test Center. I, personally, know that his instructions were carried out. As was pointed out, Miss Cochran flew in a Canadair F-86 and all maintenance, fuels, manpower, etc., cost this government absolutely nothing, as Canadair and Miss Cochran footed the bill for her F-86 flights.

The small amount of money it cost to permit her to familiarize herself with jet operation in the T-33 is far outweighed by her own contributions to the Air Force. Her ranch, located at Indio, Calif., was open for the services as a rest camp during the period of the war years at her expense, and her contributions made to the USAF as the Commanding Officer of the WASP (at no cost to the government since she refused to accept pay), plus her own personal airplane being turned over to the service for use, also at her own expense, far outweigh the cost of the T-33 flights.

It is felt by the undersigned that the Air Force could well afford to have permitted Miss Cochran to fly one of the Air Force F-86's and given her a thousand hours of flying time, and still be in debt to this wonderful and generous lady who has contributed so much of her time and money to insure that our Air Force is the best.

I, personally, have flown with Miss Cochran in the T-33 during her transition flights; therefore, I know she is a well-qualified pilot and, had I thought she was not an excellent and superior pilot, I would have recommended that she not be permitted to make the flights that she did. Further, I am proud to know Miss Cochran and feel perhaps a little instrumental in gaining back to this country the records that Miss Auriol of France had previously held.

FRANK K. EVEREST, Jr., Lt. Col., USAF
Box 43, Hq AFFTC
Edwards Air Force Base
Edwards, California

'Aviation Report'

We noticed in your issue of Aug. 3 a paragraph (Editorial) headed "Novel Viewpoint from Britain" in which references were made to Aviation Report. In it you refer to the Report as a "newsletter," and further on you say "the publication urges" etc . . . We would point out (and should be grateful if you would publish this letter to inform your readers as they have been misinformed) that Aviation Report is not a newsletter or publication. It is a confidential (and marked so) report prepared by Aviation Studies, Ltd., aviation business research group, for private circulation. In their own interests all subscribers are asked to respect the confidential nature of the report.

JOHN LONGHURST, Director
Aviation Studies, Ltd.
29-31 Cheval Place
Knightsbridge, London, S. W. 7
England

More on Collisions

We find Captain Robson's Cockpit Viewpoint in your July 6, 1953 issue a very weak apology for airline pilots' part in mid-air collisions.

Despite his statements, we still believe that a slower aircraft cannot overtake a faster one. On a collision course, the faster aircraft will have the smallest angle between its course and the other craft, and must therefore be considered the "overtaking" aircraft.

We further do not agree that the fact that these collisions occur during periods of good visibility proves anything, except that the overtaking aircraft in all probability had its pilot's head "in the cockpit."

Finally we completely disagree that troubles do not occur where adequate communications exist. We recall a collision between a Bolivian pilot in a P-38 and an airliner at Washington where certainly complete and functioning radio control was in operation. Complete reliance on radio control is dangerous, both from a malfunctions point of view, and due to the fact that the pilot is responsible for his plane only, whereas traffic control at times may be swamped with situations.

Of course we agree with the Captain's conclusions concerning adherence to the rules, adequate communications and a sharp lookout. We feel, however, his article is dangerous in that it lulls the airline pilots' sense of responsibility.

J. C. SCHWARZENBACH, President
U. S. Propellers, Inc.
3270 East Foothill Boulevard
Pasadena 8, California

AVIATION CALENDAR

Sept. 1-4—Pacific general meeting, American Institute of Electrical Engineers, Hotel Vancouver, Vancouver, B. C.

Sept. 5-7—National Aircraft Show and 50th anniversary of powered flight, Dayton (Ohio) Municipal Airport.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, England.

Sept. 7-17—Fourth International Aeronautical Conference, joint meeting of RAeS and IAS, London.

Sept. 8-9—Second half of Airmail Pioneers National Convention, Cheyenne, Wyo.

Sept. 9-11—1953 conference on nuclear engineering, University of California, Berkeley.

Sept. 9-15—Joint meeting of the Royal Meteorological Society and the American Meteorological Society, University of Toronto, Toronto.

Sept. 10-11—Second conference and seminar of the American Society of Traffic and Transportation, University of Pittsburgh, Pittsburgh.

Sept. 14-16—National Flying Farmers Assn., 1953 convention, Wichita.

Sept. 19—Canadian National Air Show, sponsored by Toronto Flying Club, Toronto.

Sept. 20—Naval Air Reserve Day commemorating 50th anniversary of powered flight, Niagara Falls (N. Y.) Municipal Airport.

Sept. 21-25—Eighth National Instrument Exhibit, Instrument Society of America, Sherman Hotel, Chicago.

Sept. 22-25—1953 meeting of Aircraft Spark Plug and Ignition Conference, Champion Spark Plug Co., Toledo.

Sept. 28-30—Ninth annual meeting, National Electronics Conference, Hotel Sherman, Chicago.

Sept. 29-Oct. 1—American Institute of Electrical Engineers, middle eastern district meeting, Daniel Boone Hotel, Charleston, W. Va.

Sept. 29-Oct. 3—SAE National Aeronautics Meeting, Aircraft Engineering Display and Aircraft Production Forum, Hotel Statler, Los Angeles.

Sept. 30-Oct. 2—Aircraft electric equipment conference, American Institute of Electrical Engineers, Benjamin Franklin Hotel, Seattle.

Sept. 30-Oct. 2—Series of seminars on transonic testing in windtunnel, Purdue University, Lafayette, Ind.

Oct. 1-3—Air Reserve Assn.'s annual convention, Angebilt Hotel, Orlando, Fla.

Oct. 5-9—General meeting of the International Air Transport Assn., Montreal.

Oct. 10—England-Christchurch (New Zealand) air race.

Oct. 13-15—Air Transport Assn.'s annual Engineering and Maintenance Conference, Saxony Hotel, Miami Beach, Fla.

Oct. 14-15—Annual airport development and operation conference, sponsored by New York Dept. of Commerce, Onondaga Hotel, Syracuse, N. Y.

Oct. 14-16—American Institute of Electrical Engineers, sixth annual special conference on machine tools, Hotel Cleveland, Cleveland.

Oct. 15-16—Aircraft Electrical Society, 10th annual display meeting, Pan-Pacific Auditorium, Los Angeles.

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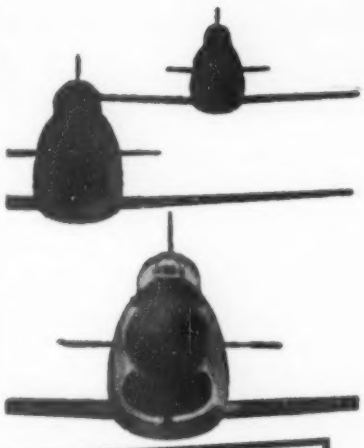

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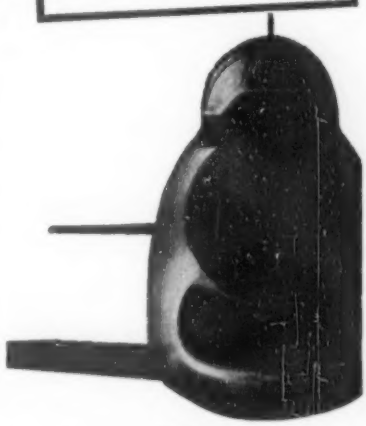

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EDITORIAL

Americans Patronize Progress

There's a lesson for commercial aviation in the astonishing public use of the New Jersey turnpike. Auto traffic in the first six months of this year exceeded the volume that "experts" had forecast for 1971. That's on a toll road, mind you, with all competing roads free.

Americans like to travel when it's easy, quick, safe and economical. They will change their habits overnight to get something better.

All of the laborious statistics you can drag up out of the past sometimes add up to precisely nothing but a deterrent to progress when it comes to forecasting whether some new services will or won't pay off.

That is why the Civil Aeronautics Board has been so wrong in refusing to encourage new air services for experimental short-term periods. They dragged their feet on certificating cargo lines. They delayed the helicopters. They seek to kill off the nonscheduled passenger lines, even though the certificated carriers still are not meeting the transcontinental demands.

America is dynamic and growing. So is aviation. Those who try to stifle the growth of either are doomed to failure ultimately. Unfortunately, they are able to succeed for a while—until the pressure for growth precipitates an explosion. We are approaching one of those explosions on the nonscheduled air carrier situation, for example.

We are betting on those who are willing to take chances betting on aviation's—and the nation's—growth.

The Sabre—A Great Ship

This is a tribute to the Sabre, a remarkable fighter.

The Korean combat record of North American's versatile MiG-killing F-86 jet is well known. Less publicized is the fact that it has attained a standardized international status that is probably unmatched in aviation history.

Recent first flight of Australia's first F-86 from a field near Melbourne put the sweptwing Sabre into the armament of another of the British commonwealth countries, along with the Canadian-built Sabres which are becoming an important bulwark for the British RAF as well as the Canadian RCAF.

North American also has a licensing agreement with the Italian Fiat Company for production of the F-86 airplanes in Italy.

Besides the three licensed foreign versions, North American itself is building several versions of the basic airplane at its two plants in California and Ohio, both for the U. S. Air Force and the U. S. Navy. Current planes in production are the F-86D, F-86F, and F-86H for the Air Force and the FJ-2 and FJ-3 for the Navy. In pre-production stage is a super Sabre, the F-100, which will carry on the line.

To get Commonwealth Aircraft of Australia into production faster, North American provided 100 complete sets of airframe parts, along with jigs and toolings. As a result, the initial flight of the first Aussie Sabre was made in less than a year from the start of production.

Canadair, Ltd., first licensor, has been producing Sabres since 1949.

It is no wonder that the Sabre is popular:

It has had a monopoly on the world's official speed record since 1947, with four different Sabre models sharing in the laurels: the F-86A, F-86E, F-86D and the Canadian-built Orenda-powered F-86E.

Far East Air Forces' boxscore on the combat record of the F-86 vs. the Russian-built MiG 15, in Korea, showed 838 MiGs destroyed, as compared to 83 U. S. jets lost in air-to-air combat.

A revised Fifth Air Command tally credited the F-86 with 800 MiG-15 kills in Korea, while only 58 of the Fifth's Sabres were lost in air combat.

These statistics demonstrate that the Sabres carried the brunt of the first-line air-to-air combat for the U. N. in Korea.

During the latter part of the Korean conflict, F-86F fighter bombers, which could be used also for air superiority after they dropped their bomb loads, scored heavily in interdiction raids.

After several years of postwar experimentation with other jet carrier fighter types, U. S. Navy turned to the basic combat proven Sabre F-86 airframe which, with only minor changes, has now become the FJ-2 carrier fighter.

Many of us in aviation are ready to label the Sabre the No. 1 airplane of the free world for air superiority control.

Stand By for Treachery

There's a truce in Korea, but let's keep our powder dry.

A dribble of press reports on the news wires do nothing to raise our esteem for the word of the Communists. Radar showed a flurry of aerial activity over the Yalu, almost as the truce was signed. The planes were not ours. Communist troops were reported streaming into North Korea from Manchuria. Next, the Commies were revealed by released prisoners to have tried and sentenced many of our G. I.'s to imprisonment just before the fighting ended, on trumped-up charges.

AVIATION WEEK Aug. 10 pointed out that the truce terms were bitterly disappointing to our Air Force. The Commies are allowed to build up North Korean airfields. Our air forces, meanwhile, are officially prohibited from carrying on aerial reconnaissance of North Korea. "Air Force position in Korea, none too secure at best, thus will be even worse if fighting is renewed," this magazine said, quoting Air Force officers.

Treachery is standard operating procedure for the Commie brigands. We should hold ourselves ready for more of it, and the next time—if these international bandits ask for it—we should give them everything we have. That would be a contrast to the "war" of the past three years, wouldn't it!

—Robert H. Wood

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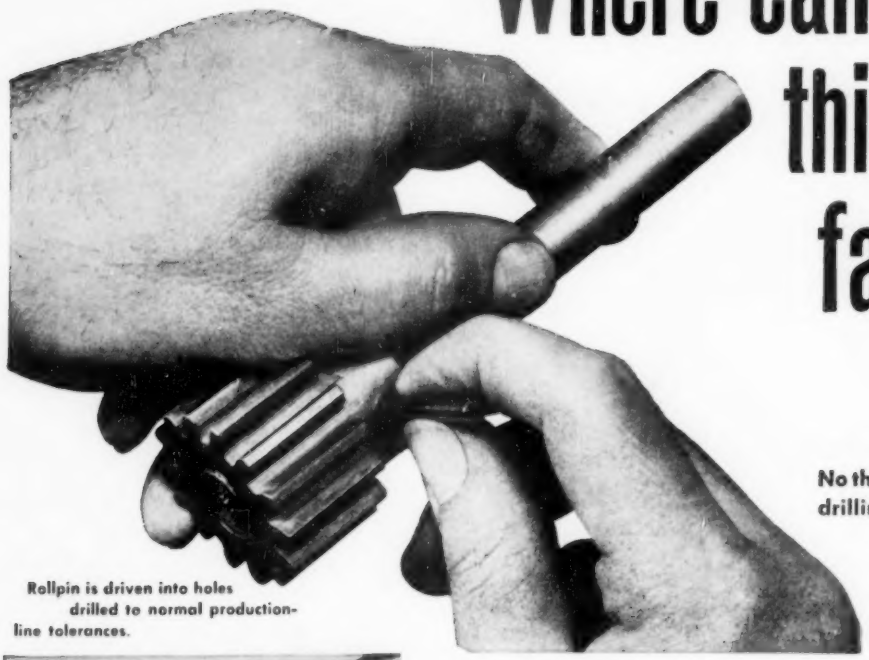

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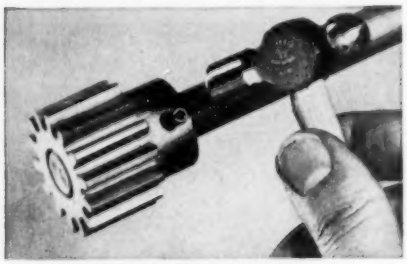

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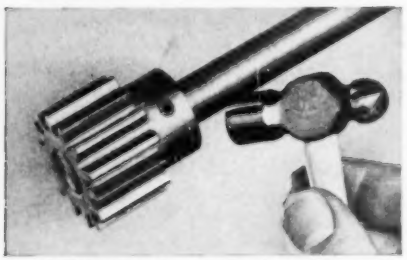

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